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FOOD MANUFACTURE

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FOOD MANUFACTURE

Vol. XI, No. 12 December, 1936

The League and Nutrition

THE RECOMMENDATIONS of the second committee on nutrition were accepted by the Assembly of the League of Nations last month. While international co-operation as to the exchange of ideas and in the organisation of agricultural produce are looked forward to as something for the future, the main tenor of this report seems to be the urging of individual national action as the first step. The recommendations will therefore be passed on to the various Governments, which, presumably, will take what individual action they deem advisable or possible. One set of the recommendations deals with improving the scientific basis of nutritional policies. Governments are asked to encourage the study of dietetic requirements, existing inadequacies and prices, supplies and consumption. More important, they are urged to discover by which means and to what extent their national statistics of the supply and consumption of individual foods can be improved. Another section of the recommendations pleads for a consideration of the dietary needs of special sections of the community, expectant and nursing mothers, children, and the unemployed. This is a very important problem, and to our mind one of the most important in the whole question of nutrition, or should we say malnutrition. Finally, the recommendations impinge on economic aspects, and Governments are asked to take steps to make food supplies, especially protective foods, available at prices within the reach of all. The committee recommends closer collaboration between producers' and consumers' organisations and the evolution of agricultural production in order to satisfy the requirements of sound nutrition.

The Modus Operandi

Governments are recommended to set up bodies under their control and in contact with scientific institutions, to be centres of research, study and propaganda, "a centre where the recommendations and principles laid down by experts can be adapted to national conditions". They are also asked to promote the international standardisation of the technical analysis of foodstuffs and the control of preparations sold primarily for their vitamin content. The provision of standards of reference and specification is demanded for the grading of all kinds of food according to quality. These are very sound and far-reaching recommendations, but the greatest care must be exercised lest the problem becomes too academic and the practical problems buried in a mass of statistics. The accumulation of statistics may be useful or worthless; it is the action taken as a result of the statistics that matters.

Food and Defence

We will be as brief as possible on this theme, though we would dearly like to let our feelings about it flow into oceans of words. We said last month that we did not feel at all optimistic about the official attitude towards this subject. Now we have every reason to be pessimistic, but we shall never say "die". So far as the defence debates are concerned, nothing was said as to how this problem is being tackled. A passing reference was made by the Prime Minister to the creation of stocks of food and to possible arrangements for food control, the investigations of which "might take some time yet". We suppose we must feel gratified that the necessity for creating stocks of food is officially recognised, but it is lamentably obvious that the matter is considered to be of least importance in the defence of this country. That it is the most vital aspect of our defence problem has now received the support of Sir Arthur Salter, who, coming into the discussion very late, said in a letter to *The Times* of November 20: "There is one aspect of our defence problem which . . . merits more serious and urgent consideration than it appears to be receiving. Our dependence in war

time upon oversea imports, though it cannot be eliminated, could be substantially lessened by the storage in peace time of grain, feeding stuffs, and oil . . . the cost of storage, though considerable, would give better value in security than the allocation of an equal sum to any other kind of additional protective measure. . . . Apart from other advantages, the storage method of increasing security has that of being obviously defensive in character and not provoking competitive countermeasures by other countries." Need we say any more?

Farming and Defence

The problem of the part which home agriculture should play in the production of national security is certainly being investigated in diverse ways and interest in the question kept alive in various quarters. Recently, Lord Lymington addressed the Farmers' Club on the subject and, we think, raised points that are of paramount importance. He laid particular emphasis on the value of maintaining and developing the fertility of the soil as a national asset. His main thesis was that a sound agriculture is necessary to restore and maintain morale and physique, and, through the somewhat novel view that as our soil is the most potent in the world for producing pedigree and other cattle, he argued that biologically it must be the best for men and women if properly used. This argument may or may not be sound, but we agree to a large extent that physical degeneration, now widely deplored, does come from the failure to use our own soil to grow more of the food consumed in this country. Lord Lymington emphasised a point that we have made on many occasions, which is, that our present policy as far as it goes is wrong, because production is being subsidised at the expense of fertility. The wheat and beet subsidies are typical examples of this. A balanced policy of agriculture is what we require, and in such the claims of livestock should no more be ignored than those of wheat and beet exaggerated. There are, we are pleased to say, healthy signs of a more rational viewpoint being taken on agriculture as a whole.

Mr. Elliot Passes By

The office of Minister of Agriculture is, as a rule, rather short-lived, as it is usually regarded as a stepping-stone to greater things. There have been more Ministers of Agriculture than Prime Ministers in the last twenty years. It is a pity that such an important office should have such frequent changes. It really demands a permanent leader who could develop his policy over a number of years. It was thought that some measure of permanency was being achieved under Mr. Elliot, who has put in four very arduous years at the Ministry, and it was expected that he would remain there until his marketing schemes were either thriving or dead. Now he has gone to take up the duties of the Secretaryship of his native land. Whatever may be the results of his efforts, none can deny that they have been strenuous and wholehearted. There have been some achievements but many disappointments in the development of a national agricultural policy. In spite of this it can safely be said that Mr. Elliot held the confidence of farmers throughout the term of his office. They have felt, and no doubt still feel, that while the early optimism of the marketing schemes has not been justified, Mr. Elliot was doing his best to steer agriculture on a course leading to better times. His failure, in spite of genuine effort, should convey the message to his successor Mr. Morrison that an entirely new policy must be sought. We wish him well.

By-Products in the Food Industry

The utilisation of the by-products in a big industry like chemical manufacture is a formidable branch of the industry. Often waste products have proved to be sources of chemical substances of undreamed-of scientific or commercial value. That the food industry has not been slow to investigate the value of its by-products is shown by the three very interesting papers given at the meeting of the Food Group of the Society of Chemical Industry held at Birmingham on November 6. On this occasion the party first of all visited the works of Marsh and Baxter, Ltd., at Brierley Hill, engaged on bacon and ham curing and the preparation of meat products. They also saw how the by-products of that industry are utilised. Even the hairs are recovered, and a waste product that was once burned in a destructor is now a source of employment for fifty people in one factory alone. Mixed with horse hair, the short hog hair is used in upholstery work, and the long hairs are graded and disposed of to the brush manufacturers. At the meeting in the evening Mr. A. W. Knapp, M.Sc., F.I.C., M.I.Chem.E. (Chief Chemist of Cadbury Bros., Ltd.), and Mr. A. Churchman, M.Sc., A.I.C., reviewed work previously carried out on the use of cocoa shell as an accessory fodder. The shell has been found to possess a high vitamin D content. By feeding cattle with two

pounds of cocoa shell per day in their rations the vitamin D potency of milk had been raised during the winter months to that of the summer level. Professor R. H. Hopkins in a paper on "The Utilisation of Brewery By-Products" dealt in particular with yeast used for the production of extracts, pointing out also that spent grains are used as feeding stuffs and hops as manure. The preparation of pharmaceutical gland products was the section of his subject "The Utilisation of By-Products in the Meat Packing Industry" particularly referred to by Mr. Osman Jones, F.I.C. He gave general information about the plant used, and stated that 25,000 cattle gave only 1 lb. of suprarenal glands. Dr. H. E. Cox, Treasurer of the Food Group, took the chair at the evening meeting.

Pork and Bacon

The dispute between the Pigs and Bacon Marketing Boards has now been settled by the arbitration of Sir Robert Greig, and it would appear that the stage is set for a smoother correlation between the two. This being so, bacon will become the main market for pigs, and the interesting question arises as to the future of the pork market. Pork must undoubtedly be regarded as a by-product, but there will always be a good supply available. Perhaps it is better to regard pork as a surplus production to enable the bacon market to be supplied as evenly as possible. Contracts are made for delivery twelve months ahead, and no farmer could so manipulate his pig production as to provide the exact number of bacon pigs for which he has contracted. Indeed, to be perfectly certain of fulfilling his legal contracts he will produce more. It must be remembered, however, that a pig which produces good bacon may not give good pork. In pork, external conformation is not so important as it is in bacon, but, on the other hand, the internal formation is of greater importance for the pork trade than for bacon. In bacon there must not be too much fat, but in pork the emphasis is on the presence of plenty of lean. We feel that, although a certain amount of the bacon surplus pigs will go into the market as pork, farmers will have to breed some pigs specially for pork.

The Ideal Porker

We have said above that in pork the presence of lean is essential. Now a lean side of bacon can be produced from a carcass with very little fat, but which is also deficient in lean. A pork carcass, however, which has neither fat nor lean, will obviously have too big a proportion of skeleton. It is an understood thing that pigs produced specifically for the pork trade should be of a breed type which develops early. Hence, if porkers are to be selected from groups of pigs that are essentially baconers the pork type should be selected for slaughter at the lighter weights. It is a common, but erroneous, belief that weights of 40 lb. at eight weeks are not obtainable in this country, but if looked after properly they can be got, and if these weights for age are achieved they will go a long way towards producing the ideal porker. At that weight weaning is not difficult, and the pigs should go on to finish at about 100 lb. live weight at sixteen weeks. There has recently been much research on pigs, and it has now become evident that gilts make better bacon carcasses than do hogs, and conversely the males are better suited to the pork market than the females. In the enthusiasm for bacon production, the importance of which we are not for one moment decrying, we must not forget the demands of the pork market which, after all, plays an important part in our general scheme of food manufacture.

The Canning Exhibition

Liverpool seems to have been a happy choice in many ways. The Exhibition was well attended, though record figures were not reached. It is unfortunate that larger halls cannot be rented in these provincial cities in order that the display of fruit and canned foods can be more effective. Accommodation was again taxed to its maximum capacity both as to stand space and room for visitors to move about freely. Whilst the exhibits of the canners are still supported by those of the can and canning machinery makers—we refer, of course, to the canning section—there was a noticeable absence of anything moving. Moving machinery, especially if it is actually producing something, always seems to make a tremendous impression on the public. If, however, the limits of the Exhibition or the halls in which it is held make it impossible to show the wheels going round, then some form of central exhibit for canning might be organised with good effect. There is the Palace of Beauty, which until this time comprised all fruit exhibits. The Potato Marketing Board gives cooking displays in a very attractive little theatre. The canning side ought to have its counterpart. There is no need to revive the idea of the canning line. A much more effective way of showing how food is canned from beginning to end of the operation is by means of the documentary film, and a small theatre in which two or

three, or even one, film could be shown continuously throughout the day would have excellent results. The Ministry of Agriculture have already led the way by producing a film about fruit canning to popularise the National Mark. The canning industry is not in a state of rapid development, so that films made now would be assets for a good many years. We should have thought that all the canning interests in co-operation with the Ministry of Agriculture ought to be able to raise sufficient funds to make one or two films showing the canning of different kinds of foodstuffs in this country, and to utilise these, beside showing them at the Exhibition, as a part of an organised publicity scheme. We would also endorse the suggestion made by Mr. Sherwell-Cooper at the Canning Conference, that there ought to be a National Food Canning Council Bureau at the Exhibition to answer questions and disseminate information. This would be very valuable indeed. The elaboration of this idea in the form of a permanent bureau is also to receive attention.

Conventional Canners

So far as the Canners' Convention is concerned, all the arrangements for meetings and conferences were very happily made. The Convention hotel, the Conference and Exhibition halls were all situated within almost a stone's throw of one another. The weather behaved splendidly, and the Food Manufacturers' Golfing Federation Tournament, which for once was played in sunshine, attracted a record number of entries. The Convention Ball was so much enjoyed that the Chairman was able to announce an extension of the hour, and, being held in the Convention hotel, parties of friends enjoying themselves appeared not to diminish in size even in the very early hours of the morning.

The conference on "The Revision of the Ottawa Agreements" produced a result which it is hoped will have a good effect in the right quarters. The discussion of a "Publicity Scheme for the Removal of Professional Prejudices against Canned Foods" unfortunately suffered from inadequate preparation, and although the scheme, which was presented for the first time at the meeting, was referred to the Executive Committee for action, there was a feeling that the discussion was inconclusive. If only the memorandum from Sir Edgar Jones, which it was proposed should be sent out to doctors and nurses, could have been circulated earlier, and authorities on various aspects of the subject invited beforehand to address the Conference, the result might have assumed quite a different complexion, and a more conprehensive scheme of publicity, which is desired by everyone, might quite possibly have been set on foot. There was a disappointing attendance of growers at the Conference, presumably because there are relatively few growers in the Liverpool district. Nevertheless, the Conference with the growers yielded some very interesting and useful information. A full report upon the Exhibition and of the two Conferences, a review of the Ministry of Agriculture canning film, and a detailed examination of the publicity scheme will be found in *Food Industries Weekly* for November 6, 13, 20, and 27.

The Milk Kick

Wandering around the usually sedate and sober streets of Manchester not many days ago our attention was claimed by a brilliantly lighted and attractive looking milk bar, and we were beguiled into a further investigation of its beverages. The milk bar has emulated its alcoholic predecessor, the cocktail bar, at any rate in its choice of glamorous names with which to differentiate its various shakes. One gets a thrill of the Middle West from a drink with a name like Pine Breeze, and what visions are conjured before our eyes when we are regaled with a Purple Kick, and under the influence of the Piccadilly Thrill we almost saw Eros before our eyes with all the bustle and swirl of London's enjoyment seekers. There is no lack of ingenuity in the preparations. One drink is oxygenated (whatever that may mean), and the process is said to put a "certain liveliness" into the drinker—milk for men, what? In winter, when Manchester's real raw weather is at its rawest, the bars are dispensing soups—asparagus, mushroom, and so on—all made with milk. We saw a bright young thing fresh from the cinema enjoying a real frothy ice-cream shake next to a tired-looking man just liberated from a late sitting at the office sipping asparagus soup. Both were enjoying themselves and drinking milk according to their fancy and to the benefit of their health. May these bright and breezy bars prosper.

Bacteriological Tests for Graded Milk

The Ministry of Health has issued a Memorandum (139/Foods/Jan., 1937) dealing with the Bacteriological Standards for Graded Milks prescribed by the Milk (Special Designations) Order, 1936. The grades are described, and information is given as to sampling, transport and storage of samples, technique of tests and forms of reports. The price is 3d. from H.M. Stationery Office.

MODERN CONDENSED MILK MANUFACTURE

II. Advances in Apparatus

The second instalment of an article on this subject by Dr. C. KNOCH (of ROHR, STUTTGART). The first part was published in our October issue, and the third and last part, dealing with Evaporated and Dried Milk, will be published next month.

AT THE present day a wide range of auxiliary and control equipment is available for regulating quality of the product at different stages in manufacture. When systematically employed on the correct lines they may be relied upon to maintain a high standard of quality. Vigorous efforts are being simultaneously made in the department of machine and plant construction with the object of simplifying still further the technique of condensed milk manufacture and, above all, of introducing a wide measure of mechanisation as a guarantee of successful production. Some of these improvements which have recently given particularly valuable service will now be described.

1. **Enamelled plant.** One of the most important improvements in plant construction concerns the design of a metal-free enamel coating upon all parts of the plant coming into contact with milk. The relative effects of different materials of construction on the product have already been discussed in the previous article in the October number of FOOD MANUFACTURE. The increased installation costs of the glass-enamelled plant will be offset in a very short time by the increased working safety, the greater ease of cleaning and the avoidance of ruined batches.

Objection may, however, be raised that glass-enamelled heating vessels increase fuel consumption owing to their poorer heat conductivity, but this is not of such serious consequence to-day because metal and lining thicknesses do not have to be so great. In storage tanks a thicker enamel lining has its advantages since it retards heat exchange.

2. **Straining and filtering equipment.** Since a catalytic reaction may follow mere contact, it is also likely to occur when using metal filters or strainers, passage through fine-mesh sieves or filters exposing an entire batch of milk to a catalytic surface of enormous area. Even if each drop is only in contact with the metal for a small fraction of a second the effect must be enormous.

Scarcely any reference is made to-day in the technical literature to the influence of metal sieves upon the quality of milk; and in practice they are (possibly instinctively) avoided and their place taken almost invariably by cloth strainers owing to their superior filtering action. Even filter presses of the largest capacity are fitted with filter cloth.

For filtering thick syrups (sugar-containing substances) the "jalousie filter", represented schematically in vertical section in Fig. 6, has proved extremely convenient; it derives its name from the jalousie-like stretching of the filter cloth in the vertical straining-openings for the liquid. A rectangular internally enamelled chamber, A, of sufficient size with screwed-on cover, B, likewise enamelled on the underside, is divided up into several (3) divisions by partitions reaching almost to the cover. Inside the three chambers so formed there are suspended from the lid another series of intermediate partitions, *b*, reaching almost to the floor, the lower parts of which are in the form of two parallel ladder-shaped spaces with rungs, *d*, constructed of enamelled rods. The side and lower edges of these intermediate partitions, *b*, with their ladder frames are displaced towards the inner walls and the floor of A when the cover B is placed in position and are firmly held in the grooves *c*. In the manner understandable from the sketch, a muslin straining cloth is stretched across the rungs of the ladder frame. The liquid flowing down from a vessel situated at a higher level into the first chamber (on the left) flows through the chambers and the filter cloths in the direction of the arrows, the de-

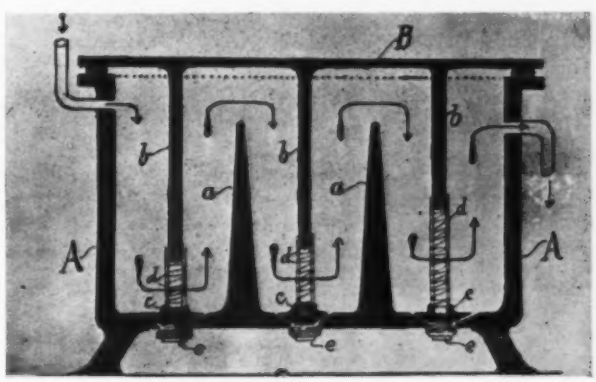


FIG. 6.—Self-cleaning filter.

FIG. 7.—Milk filter: Plate type.

posited sludge being caught below the horizontal filter cloth surfaces and directed down to the floor of the chambers by way of the oblique filter cloth surfaces. In this arrangement the smoothly tautened cloth filter possesses a high degree of efficiency and can be easily and thoroughly cleaned. A further advantage is that the deposited dirt is not compressed by the pressure of the flowing liquid, thus avoiding clogging of the pores or passage of very fine particles. Deposit collected on the floor of the chambers is washed away through the waste-pipes in course of cleaning after opening the outflow closure.

If the outer and intermediate partitions of the jalousie filter are constructed in the form of double walls to admit passage of warm water, it can be used with advantage for filtration of thick syrups and saturated liquors which deposit crystals and other unfilterable substances on cooling.

So long as the milk is still unsugared it filters easily and neatly through cotton wool discs. To obtain a large filter surface the so-called *plate filter* (Fig. 7) is brought into use. Here the filtering material is spread between two perforated metal plates and a number of these units assembled side by side in an enclosed housing in such a manner that the milk is bound to pass through the metal and cotton wool discs. Two housings of this type packed with sheets are constructed upon a common pediment and equipped with a common inflow channel which can be directed to one or the other housing by turning a tap, thus enabling clogged-up cotton wool discs to be changed without interrupting the process. The plate filter only occupies a small space in the factory.

For a great many years it has been the practice in dairies to utilise centrifugal clarifiers to separate impurities which are minute enough to pass through the openings of all screening devices but possess a higher specific gravity than milk. These machines (Fig. 8) are constructed on the lines of milk separators and, like the latter, are now designed on completely enclosed lines and thus do not draw any outer air into the milk, thus considerably facilitating later processing. With their aid discoloured sludge is removed even from the most efficiently filtered milk, and they are indispensable in factories not equipped with separators for skimmed milk.

3. **Preheaters and heating equipment.** Attention has been repeatedly drawn to the importance exercised by preheating plant upon the quality of condensed milk. This applies not merely to sweetened condensed milk, but with still greater force to evaporated and dried milk. According to the various requirements of manufacture, apparatus has been constructed which (*a*) warms the milk to the lowest permissible pasteurising temperature (65° C.) and maintains it at this temperature for the requisite period of 30 minutes (retarding vat); (*b*) heats the milk during passage through the apparatus (and only for this period) to near the boiling point, *i.e.*, about 95° C.; (*c*) heats the milk within a few seconds to 110° to 120° C. and then cools it down, generally with the same rapidity. In addition, apparatus has been designed to give performances intermediate between the above limits.

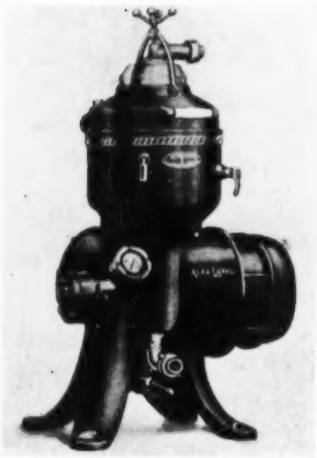


FIG. 8.—Motor-driven hermetically closed clarifier.

The types of the first group (Fig. 9) consist of a heavy double-walled hot-water heated tank with a small preheater on the top, which warms the inflowing milk up to the desired temperature which is to be maintained in the warmed and insulated vat; any creaming is prevented by suitable agitating or stirring gear.

The type of flow-through heater or preheater (Fig. 10) is a refinement on the old pasteurising kettle with stirring gear in which the milk enters through the bottom of the kettle, is forced upwards by the stirring gear and forced out through the wide exit tube on the upper side of the kettle.

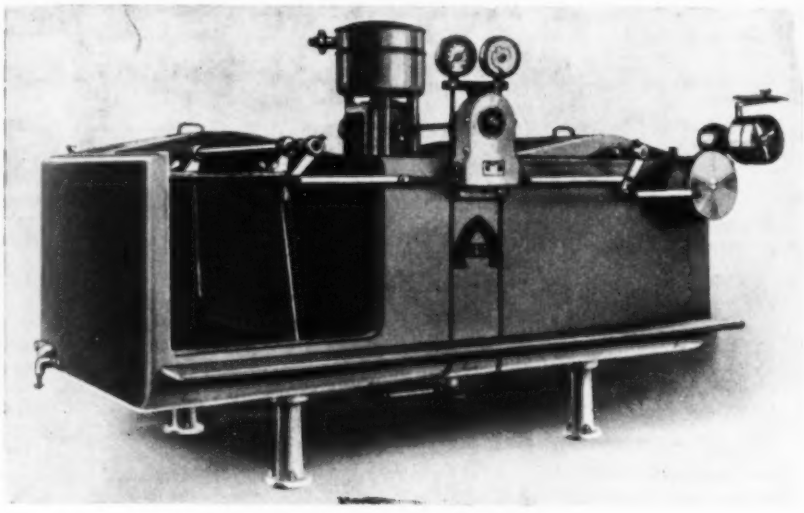


FIG. 9.—A Retarding vat.

FIG. 10.—Drum pasteuriser with motor.

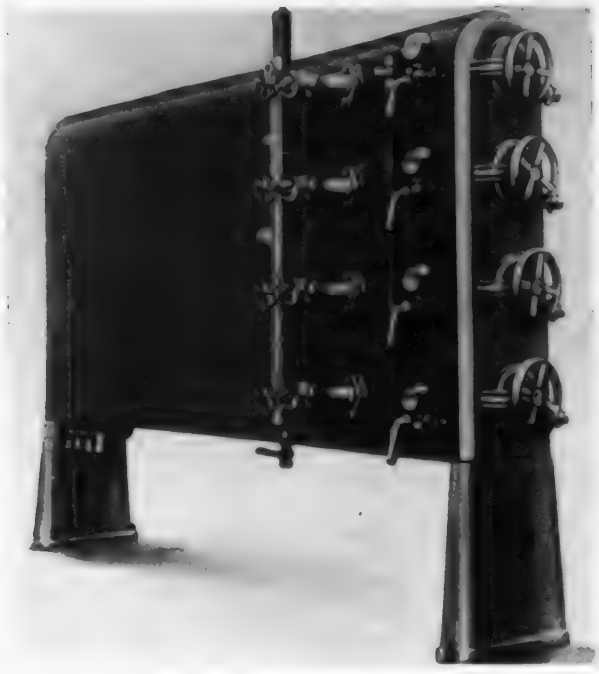


FIG. 11.—Tubular pasteuriser.

The most notable improvement over the old equipment is represented by the replacement of the stirring gear by an enclosed conical drum with externally attached "fingers", the rotation of which lifts the thin film of milk between the drum and the inner wall of the vessel during heating and forces it into the outlet tube. If desired, the drum can be fitted with heating equipment. If the hollow conical-shaped milk film is extremely thin and the rotation of the drum is accelerated it is possible to reach a temperature of 120° C. with this apparatus within a few seconds.

The third of the above-mentioned types of high temperature heaters is essentially intended to reach a maximum temperature within a second or two. This is done by running the milk with the aid of a suitable pump through externally heated long tubes on the inner wall of which it is distributed by an inserted "displacer tube" to an annular film with a thickness of only a few millimetres and rapidly carried forward. Fig. 11 shows the "Montana" heater, in which 4 milk tubes are fitted into 3 wide "cell tubes" situated above each other in the horizontal position. The inner displacers in the milk tubes can be connected with each other at the top end of the cells by flapped domes. While the upper cells can be heated with steam or hot water, provision may be made for running cold water or brine through the lower cells so that instantaneous high temperature heating and subsequent immediate cooling to any desired low temperature can be effected uninterruptedly in one and the same apparatus. It may be stressed that milk and water may be allowed to flow through the apparatus in counter-current when 60 to 70 per cent. of the heat initially consumed can be recovered by exchange between the hot and cold milk. This represents no mean saving in fuel.

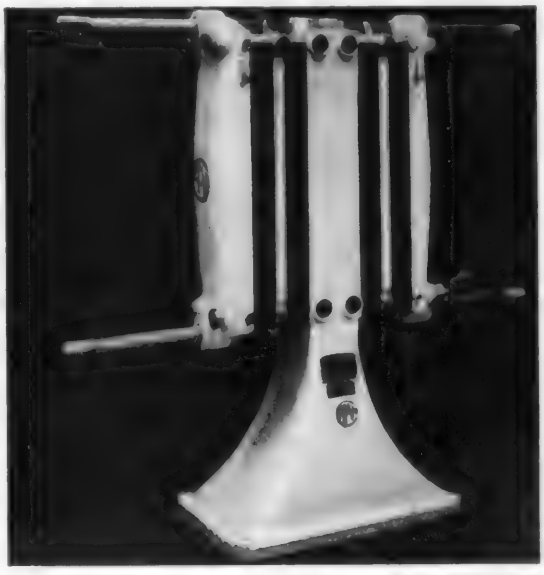


FIG. 12.—Plate machine for heating and cooling.

A special type of flow-through heater, offering the same economy in fuel and heat exchange and enjoying exceptional popularity owing to certain other advantages, is the *plate heater* shown in Fig. 12, which is designed on the lines of the plate filter described above. If we imagine the cotton wool disc in the latter to be replaced by intermediate sheets of stainless steel, the design and operation of this plant will be understood without further explanation from the illustration. The intermediate metal sheets and the metal sheets with milled-in channels form chamber pairs through which hot water and a counter-current of milk are made to flow with the aid of a special pump. The output of the apparatus can be easily increased by inserting more channel plates, while cold

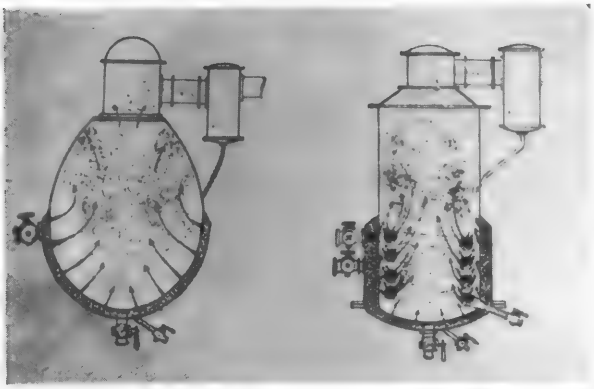


FIG. 13.—**Heating effect in evaporators formerly used.** *a*, **jacketed only**; *b*, **jacketed and coiled.**

water and brine units are easily fitted to the same apparatus.

4. **Condensing equipment** remained the same for several decades (Fig. 13a) as that used in concentrating other liquids under reduced atmospheric pressure and only underwent specialised modification at the beginning of this century.

The heating surface, formerly consisting of the jacket of the lower part of the pear-shaped vacuum evaporator (Fig. 13a), was increased by insertion of steam coils in the evaporator. But since this increased the danger of scorching of the milk along the length of the coil and also rendered cleaning more troublesome, the coil was split up into a series of smaller straight lengths which were fitted either in the form of a basket (Fig. 14a) in the evaporator in such a manner that a stream of steam passed through them when completely immersed in the milk, or else they were so built into a special heating element (drum-shaped in this case) constructed in the manner sketched in Fig. 14b in the interior of the evaporator as to permit a stream of milk to pass through while steam entering the heating element surrounded it externally.

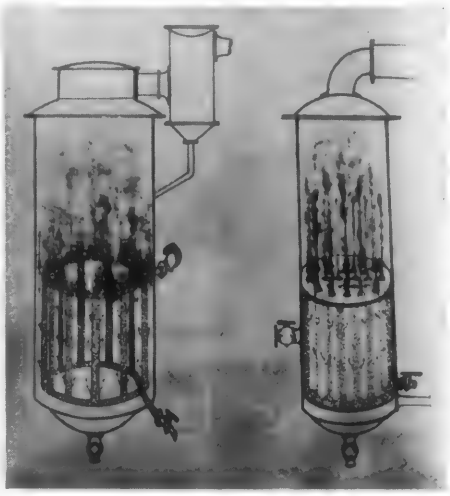


FIG. 14.—**Heating effect in tube evaporators.** *a*, **basket-sized tubes (steam inside tubes)**; *b*, **tube heating chamber (milk inside tubes).**

On these lines the built-in heating surface attained its maximum efficiency, but the intense heat transfer led to development of maximum energy on the part of the boiling mass and consequent danger of boiling over. The froth frequently carried over in the vapour current required to be broken up and de-aerated in a special froth trap in the vapour pipe and continuously returned to the evaporator. To reduce the force of the wave and to facilitate cleaning, another system of construction transfers the heating element (constructed as shown in Fig. 15 of a bundle of tubes) entirely outside the evaporating vessel. The problem of obtaining a sufficiently large evaporating surface in a very small evaporating space was overcome by the following arrangements:

Fig. 15*a*. Cascade-like distribution of the hot milk stream on several different levels.

Fig. 15*b*. Spiral flow of the milk over the evaporator base up to the constriction of the return flow tube.

Fig. 15*c*. Broadening and convoluting the milk stream to a coil-like stream in the bottom trough of the horizontal evaporating cylinder.

Using the last arrangement, the outflow of milk and release of its water vapour proceeds so quickly and uniformly that no drops are sprayed out and carried into the vapour exit, thus rendering a froth trap superfluous. Another advantage of scheme 15c is that the milk waves are not dashed tempestuously against the walls of the evaporator as is the case with the types represented in Figs. 13 and 14. The cause of agglomeration of the fat globules—*i.e.*, buttering of the milk—is thus eliminated. According to the latest patents the type shown in Fig. 15c can also be fitted with a glass-enamelled heating element, the tube of which (as in the case of Fig. 11) can be taken out in a single movement for cleaning.

5. **Cooling and crystallisation.** 100 parts boiling water are capable of dissolving about 143 parts lactose; water at room temperature will only take up about 17 to 22 parts lactose. On cooling the concentrate, which runs out of the condensing plant at a temperature of 60° to 70° C., a considerable proportion of the lactose consequently crystallises out. The larger the number of individual crystals deposited by the lactose mass, the smaller the size of each individual crystal. The fundamental condition for avoidance of sandiness is that the crystal nucleus should remain infinitely small; cooling must therefore be so regulated that the quantity of milk sugar deposited at any given instant in course of the progressive cooling should immediately take the form of new crystal nuclei and should not go towards enlarging individual crystals deposited at the previous instance. In other

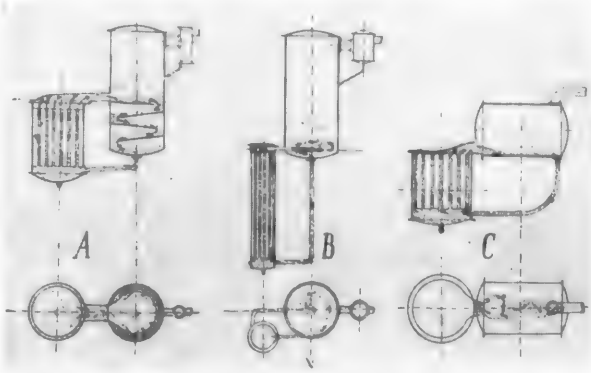


FIG. 15.—**Rapid circulation evaporator with separate heating chamber.**

words, crystal nuclei of minimum size should be forming at the same speed throughout the entire crystallising mass in which cooling or deposition of lactose is taking place. This objective, bound up with considerable technical difficulties, will be realised with all the greater probability the greater the opportunity given to the minute particles to settle *simultaneously* round millions of points. This demands that the same quantity of heat should be lost simultaneously on all these points, the temperature fall through the entire mass of condensate proceeding uniformly on all points.

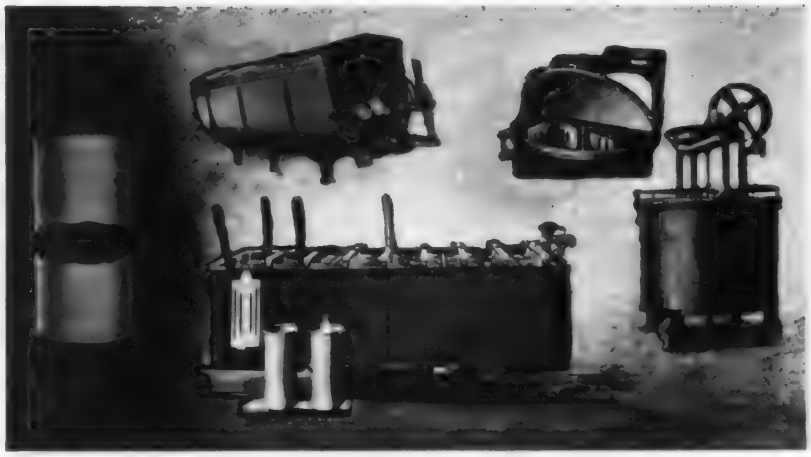


FIG. 16.—Contact-cooling and crystallisation apparatus.

Heat was given off in former cooling plants invariably as a result of contact with the cooling media; in practice, therefore, following continual circulation of the concentrated mass round cooling surfaces of maximum area. Only in recent years have plants been also constructed which exploit heat-withdrawal by evaporation as the cooling principle. Fig. 16 illustrates the commonest types of contact coolers. In the American tubular cooler (left) the concentrate is forced by a powerful pressure pump in a few minutes through a system of coils hundreds of feet long immersed in a cylindrical tank, and thence into a large crystallising tank equipped with stirrer in which crystal formation occurs in about 20 minutes at a slowly falling temperature. With the object of effecting speedier cooling to room temperature a second powerful pump is provided to force the mass through another similar coil cooler whence it is forced into the filling-off tank. This apparatus is suitable for large factories, since it is capable of dealing with enormous quantities in a very short time with the aid of a relatively small surface. The vat cooler (top left in Fig. 16) operates with horizontally rotatable propeller-like cooling vanes, likewise with insertion of a crystallising tank between two identical coolers. Here, again, very large quantities of material can be put through with very little expenditure of power, although the base surface is larger. There is no justification for the widespread view that this type of plant does not avoid "sandy" milk with the same degree of certainty as does the first-mentioned apparatus, so long as it receives the same careful supervision.

Simple, small cooling units are popular in Europe, and any desired number can be worked simultaneously from a common power unit where large outputs are required. The constructional unit (Fig. 16, right) generally provides for an output of 500 litres (100 to 120 English gallons). It takes the form of a jacketed, heatable, evaporator with a two-piece cover and a special type of stirrer. The accessory figure (left) shows a view of the beater-arm stirrer beneath the raised half-cover of the evaporator. The beater arms rotate in pairs around an axis located at the centre of the radial suspension brackets. In consequence, the particles of milk move from the cooling wall of the evaporator to the centre in a cycloid path and inevitably bring about a more rapid heat exchange than would be the case if impelled by radically located paddles on a long spiral path. Whereas this spiral route within the wide evaporator is much too long to bring about rapid heat transfer from the wall to the centre (and conversely), it is reduced to a minimum in the tall and narrow cooling cylinders of the vat-cylinder cooler (Fig. 16, centre), and here the heat exchange consequently proceeds rapidly and uniformly throughout the entire height of the tall milk column. A large number of these cooling cylinders (48 as a rule) are firmly attached with rotating discs to the base of the vat, while the beaters which are immersed in the milk mass to the bottom are clamped to the **U**-brackets and are unable to move. The heat-transferring cylinder jackets are thus simultaneously exposed to cooling water from outside and very warm milk from inside when, in consequence of the action of the large surfaces upon relatively small masses, a highly uniform and very rapid attainment of the desired low temperature occurs throughout the entire mass in the cylinder. Uniform distribution of crystal nuclei throughout the whole mass is achieved by seeding in the many wedge-shaped sections of the cylinder cells. The objections to this apparatus are the large space required and the dependence in high measure upon the skill and caution of the personnel. Notwithstanding these drawbacks this oldest type of contact cooler has not yet been displaced from the industry, and is indeed still preferred by many factories.

Only of recent years has it been displaced to a serious extent (as have all contact coolers) by equipment applying the evaporation principle for condensed milk cooling. During evaporation, as is well known, the heat required for conversion into the vapour form is withdrawn from the evaporating liquid itself and not, as in the case of boiling, introduced from an external source. The lower the atmospheric pressure over the liquid the less is the internal heat required for evaporation; hence, by continual reduction in the atmospheric pressure it is possible to reduce the internal heat of a liquid to an ever greater extent. The apparatus shown in Fig. 17 serves to cool and crystallise about 2,200 kilos of concentrate at one time, that is the same capacity as the cooling vat shown in Fig. 16. The hot concentrate is drawn into the large kettle fitted with stirring gear (pulley drive from the top

cover or electric motor drive) and the glass-enamelled kettle evacuated so thoroughly by steam injectors that the internal heat of the milk forces it to release its water in vapour form. The stirring gear ensures continuous upward passage of fresh portions of milk when they can evaporate and cool. To effect ever greater reduction of temperature it is necessary to increase the vacuum in the kettle continually, and the withdrawn vapours call for even more intense cold withdrawal from the cooling water to condense them in the condensing plant (on the right, at the window side) consisting of three superimposed tubes. In fact, the cooling water must be replaced by brine towards the end of the cooling operation when the vacuum in the kettle is almost 100 per cent. By regulation of the degree of vacuum it is possible to cool the milk at any desired speed, and even to interrupt the operation for the purpose of seeding or temporarily bringing it to a standstill. Automatic registering apparatus facilitates correct regulation of the process. If the properties of the milk are previously ascertained by analysis (viscosity, sugar content, acidity, total solid not fat, and fat) there should be no difficulty in obtaining a first-quality, sediment-free, uniform and durable product.

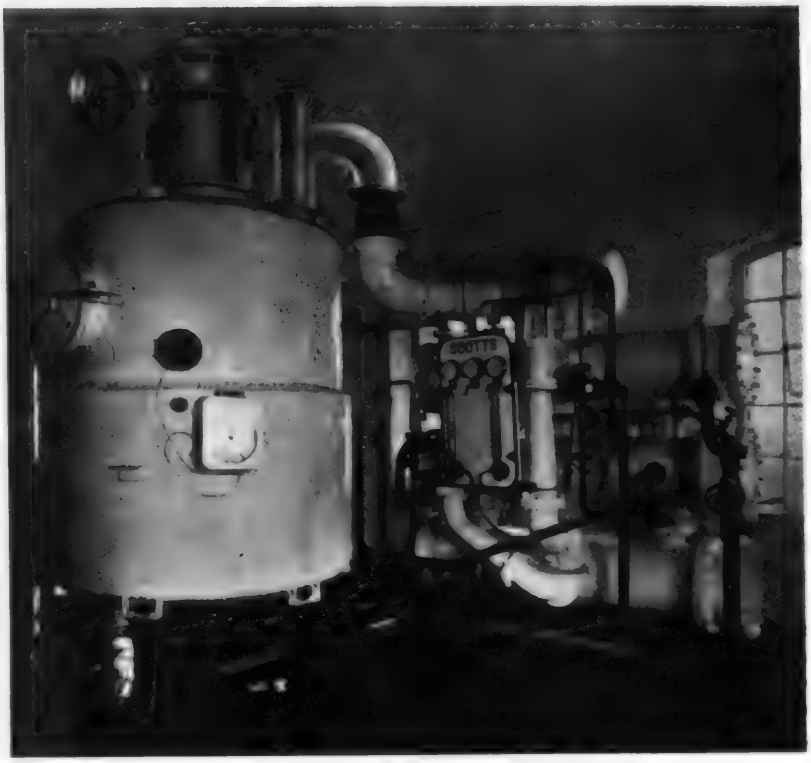


FIG. 17.—Vacuum-cooling and crystallisation plant.

FOOD MANUFACTURERS' GOLFING FEDERATION

THE third annual meeting of the Food Manufacturers' Golfing Federation took place at the Childwall Golf Club, Liverpool, on Tuesday, November 3, during the period of the Imperial Fruit Show and Canners' Exhibition and the Annual Convention of the National Food Canning Council. There was a record entry of 42 players, and the golf was played in ideal weather.

The prize-winners were:

Food Manufacture Cup.—T. W. Winterson, 69 nett.

Eburite Cup.—Maurice W. Batchelor, 77 nett.

Hidden Nine Holes (prize given by Brown and Rawcliffe, Ltd.).—A. J. Rothwell, 32 nett.

Best Nett for Member of Can Can's (prize by Major Compston, of L.C. Engineering Supplies, Ltd., and H. Franklin, of E. W. Bliss Co.—A. A. Maytham, 76 nett.

Best Nett between 18 and 24 (prize by M. W. Batchelor).—Gordon Deacon, 82 nett.

Best Nett for Liverpool Fruit Merchant (prize by Mr. Fred Waterworth).—G. W. Shaw, 73 nett.

Afternoon Four Balls (prizes by Howard Harding).—1, L. Birkett and A. N. Jones, 2 up; 2, A. J. Rothwell and R. J. Thompson, 1 up.

Other notable cards were: J. Waterworth, 74 nett; R. J. Thompson, 75 (plus 1), A. Cartwright and L. Tunston, 78.

Many cards were not returned. *Verb sap.*

SUGAR ALCOHOLS

THE following relative sweetnesses of sugar alcohols as compared with sucrose, 100, are given by Carr, Beck and Krautz, *Journ. Amer. Chem. Soc.*, 1936, **58,** 1394:

i-erythritol	238	l-arabitol	100
ethylene glycol ..	130	i-dulcitol	74
penta-erythritol ..	110	d-manitol	57
glycerol	108	dl-sorbitol	54
sucrose	100	inositol	50

It is shown that the removal of water from a sugar alcohol to form an anhydride destroys its sweetness. No correlation was found between the number of carbon atoms, hydroxyl atoms, molecular weight or spatial configuration.

PUMPING *in the* FOOD INDUSTRIES

A discussion of modern developments in pumps and pumping methods applied to food manufacture by NORMAN SWINDIN, A.M.I.Chem.E., A.M.I.Mech.E.

PUMPING IN the food industries can be divided into two main divisions—one the movement of corrosive liquids such as hydrochloric and sulphuric acids—the other the movement of actual foodstuffs, which are usually less but insidiously corrosive. The first case requires the same types of pumps and apparatus as are employed in any industry handling mineral acids, with the exception that much greater attention is paid to purity and freedom from contamination. The second case comprises a host of special pumps and lifting devices to handle fruit juices, vinegar, and thick sauces and magmas.

Consider the first case: the tanks, pipes, valves, and meters are constructed of materials which can in no way contaminate the ultimate foodstuff with arsenic, antimony, lead, iron, manganese, or even carbon. This is not to say that any materials used in the construction of such plant must not contain any of these contaminants, but that such substances must not be expected by corrosion to find their way into the foodstuffs. The problem, then, is one of corrosion and prevention of contamination.

In the second case the apparatus for the pumping of the actual foodstuffs must not only be correctly designed, but the materials should be selected to resist a peculiar, insidious type of corrosion and not in any way affect the flavour or taste. Cider, wines and beers, and milk are such delicate liquids that the materials for plant construction are limited chiefly on account of their effect on taste and flavour.

Handling Mineral Acids

The purchase and storage of pure hydrochloric and sulphuric acids which are used in the various processes of hydrolyzation of certain cereals and conversion of starches and similar products into invert sugars is now done in bulk. The road tank wagon, the elevated storage tank, with its pipe system and control valves, enable these acids to be handled almost as easily as water. If properly designed the system cuts out actual pumping in the works.

A rubber-concrete acid tank may be erected on the roof, but it is not often firms have the courage to risk putting an acid storage tank on a works building. The tank wagon employed must be strong enough to resist the pressure required to blow the acid to the tank.

Where pumping of hydrochloric acid is required it is done by ebonite-lined diaphragm, ebonite or rubber-lined centrifugal pumps, and often the acid is blown up by the acid egg or the modern form of it, the Tungstone pump. Sulphuric acid handling depends on the strength. If 96 per cent. and over, plain cast iron is satisfactory, provided air is kept away. Below 80 per cent. cold and 60 per cent. hot the same pumps can be used as for hydrochloric acid. Ram pumps of stoneware and ebonite are satisfactory provided the engineers will pack the glands every Monday morning and erect and fit them on solid beds so that the barrels are neither cracked nor bent.

Centrifugal pumps for hydrochloric acid are extremely troublesome, as the ebonite or rubber lining is not hard enough to stand the wear of the packing in the stuffing-box. Many attempts to fit sleeves of some hard material, such as glass, earthenware, and certain alloys, such as Monel metal, stainless steel, have been made, but the success is measurable. A recent attempt to overcome gland troubles of centrifugal pumps is illustrated in the diagram

FIG. 1.—An installation in a milk and cream factory showing a Kitson rotary pump constructed in gun metal, chromium finish, spline coupling, external ball bearing, no gland packings, and single end cover clamp. It is mounted on a C.I. baseplate and coupled through gearing to a ¾ B.H.P. motor. All internal parts are instantly removable, and the capacity is 500 to 1,250 g.p.h. This pump is also constructed in Staybrite and other metals.

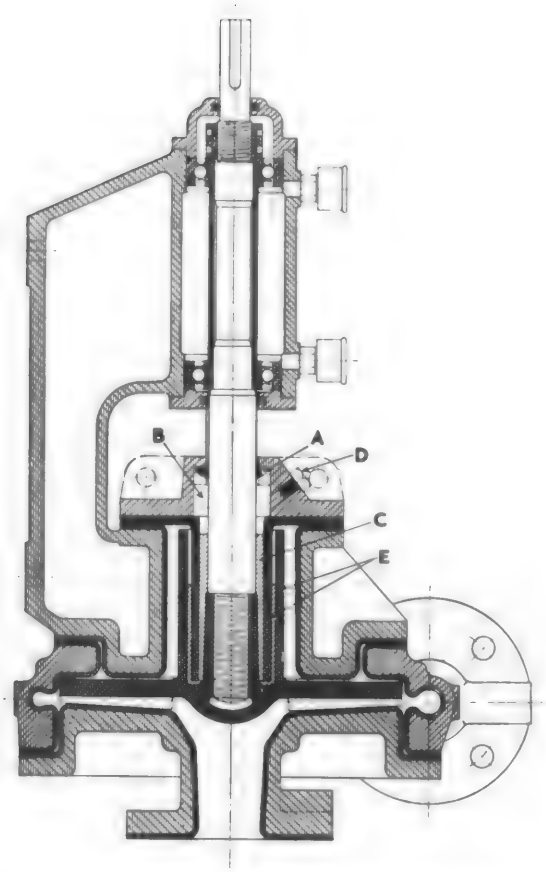


FIG. 2.—A diagram illustrating a recent attempt to overcome gland troubles of centrifugal pumps. (Patent applied for.)

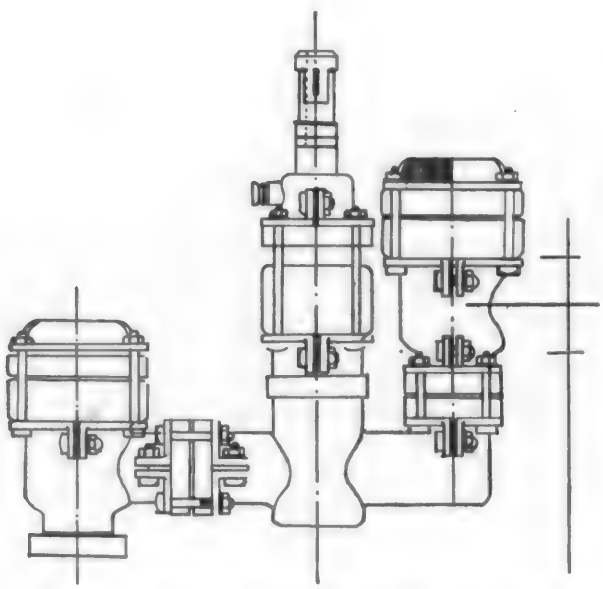


FIG. 3.—Earthenware Ram pump made by Doulton and Co., Ltd.

(Fig. 2). In this design the actual rubbing contact is at (A) between the metal and above the lined and covered parts. A grease or mercury seal (C) is the actual packing, but these substances do not wear away the sleeves (E).

Fig. 3 shows the well-known earthenware Ram pump. The success of such a pump depends on careful mounting and frequent examination of the packing in the gland. The exposed ironwork of the clips and fastenings should be protected by plastic cements and coverings. Acid-laden air is as great a corrosive as an acid liquor. A simple form of ebonite centrifugal pump is shown in Fig. 4. It is made entirely of a special ebonite material and avoids the troubles of lining metal parts with the material.

The Tungstone pump is the latest form of automatic acid egg. Fig. 5 shows a section of one of the pump chambers, and Fig. 6 a section of the air control mechanism. This pump consists simply of two small eggs (*a*), each fitted with inlet valves (*c*) and outlet valves (*d*) and an air connection (*b*). At the commencement of the cycle the air connection (*b*) is opened to the atmosphere by the control valve (Fig. 6) and liquid raises the valve (*c*) and fills the chamber (*a*) by gravity. At the end of the period determined by the control valve, compressed air (or gas or even steam) is supplied through connection (*b*) and the resulting pressure closes the inlet valve (*c*) and forces the liquid out through valve (*d*). The cycle is then repeated indefinitely, the control valve being so arranged that one chamber is filling while the other is delivering. The cycle is arranged so that the chambers do not empty completely and air is not mixed with the liquid.

The pump is supplied in cast iron lined with rubber, ebonite, enamel, and, of course, lead (but not for food factories). Made entirely of acid-resisting material, such as ebonite, the whole pump can be submerged in the tank, thus cutting out all suction piping. It has no glands, no rapid moving parts, and thus causes no mixing and churning up of the liquids. The enamel-lined type might, however, be improved. There are too many sharp corners.

Fig. 7 shows a well-known rubber, flexible diaphragm pump. This pump cannot be run at high speed, but it requires little explanation here. The acid side has no glands and therefore 99 per cent. of troubles are eliminated.

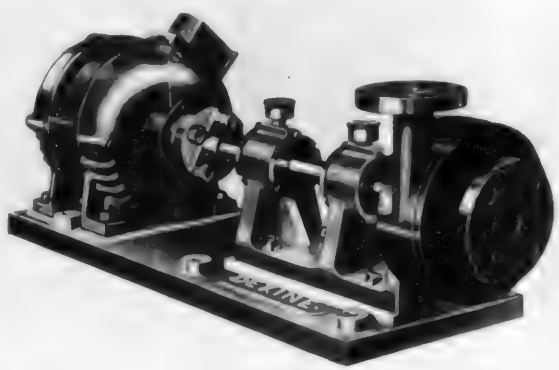


FIG. 4.—Ebonite centrifugal pump made by Dexine, Ltd. This pump is supplied in sizes from ½ to 2 in. bore capable of handling 300 to 10,000 gal. of liquids sp. gr. 1 per hour to lifts of 80 ft.

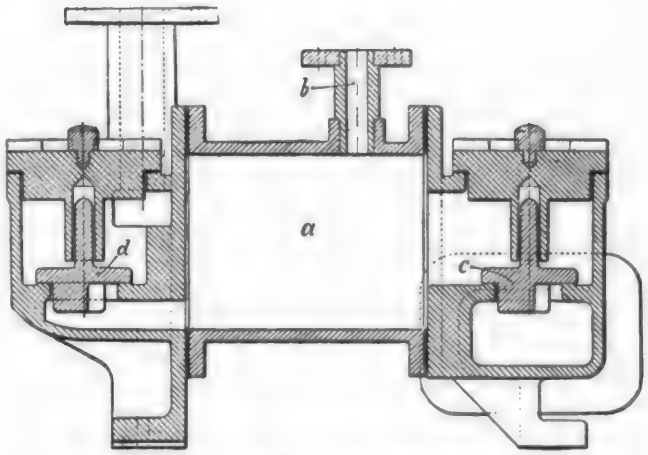


FIG. 5.—A section of one of the pump chambers in a Tungstone pump.

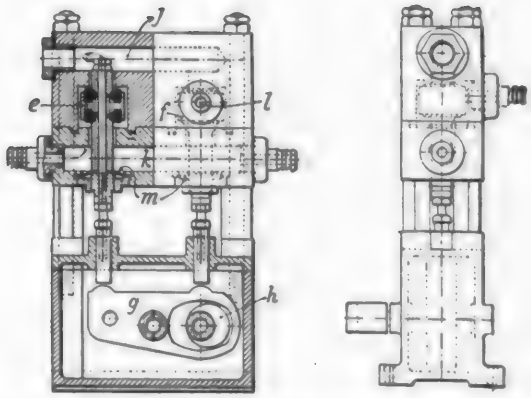


FIG. 6.—A section of the air control mechanism of a Tungstone pump.

Pumping Different Foodstuffs

The pumping of foodstuffs is a many-sided affair, though the problem usually boils down to the choice of the right material of construction to suit the particular foodstuff and the design of pump required. Close collaboration with the makers of pumps is always advisable. In pea canning, for instance, the pea liquor is highly corrosive, since it contains salt, citric acid, sugar, soda, and certain colouring materials. The plant used in applications such as this may be constructed of stoneware, glass or enamel-lined iron. Soft rubber and ebonite, or special brands of it, are in some cases replacing these hard materials.

Probably no food manufacturer would use rubber, ebonite, glass or earthenware equipment if he could find a suitable metal or alloy. There are a number of alloys which have sufficient resistance to corrosion as not to affect the taste and flavours of fruit juices, jellies, pectin, beef extracts, cider, soups, pickles, or sauces. Foremost of these are Monel metal and stainless steel. It is easy, of course, to fabricate pumps of any design in these metals. As, however, these alloys are expensive it is not surprising that cheaper alloys are found in use. These are usually aluminium bronzes. Pure nickel is widely employed as material for pumps for milk, fruit juices, wines, spirits, essences, etc. Nickel is easily deposited on iron, and much plant in the food industries consists of nickel-covered iron. Pumps made of "Barronia" metal are used for acetic and citric acids, vinegar, sulphuric, sulphurous acids, molasses, crude alcohol, and glycerine. This metal can be cast as well as drawn and extruded, so that both reciprocating and centrifugal pumps can be manufactured. Food pumps, since they have to be easily dismantled, are simple enough to have their parts chromium plated or fescolised (covered with nickel) to suit certain purposes.

For pumping pea liquor in canning, to return to an original example, one works may use the air lift method and another a rotary pump constructed in an acid-resisting bronze. For pumping pastes and thick creams some simple form of rotary pump is necessary. These pumps are valveless, for thick creams and pastes will not lift valves, and are absolutely positive in action. Construction is such that the material being moved must not be churned up into froth. For very thick pastes such as glue, gelatine, chocolate, molasses, syrups, glucose, glycerine and margarine a type known as the valveless rotary plunger pump is used. An example of these is illustrated in Fig. 8.

For thinner liquids such as creams, milk, thin sauces, jams, fruit juices, beer, vinegar, some of the many forms of bladed or gear-wheel type of rotary pump are employed. This type of pump has a rotating disc, with three stout pins fixed to move round a circular track formed by the outer casing and the surfaces of a half-moon division plate and a two-notched cam. The "Drum" pump and other pumps like it consist of a set of gears revolving in an elliptical casing; whilst the "Feuerheard" pump, originally developed for pumping wine in Portugal, con-

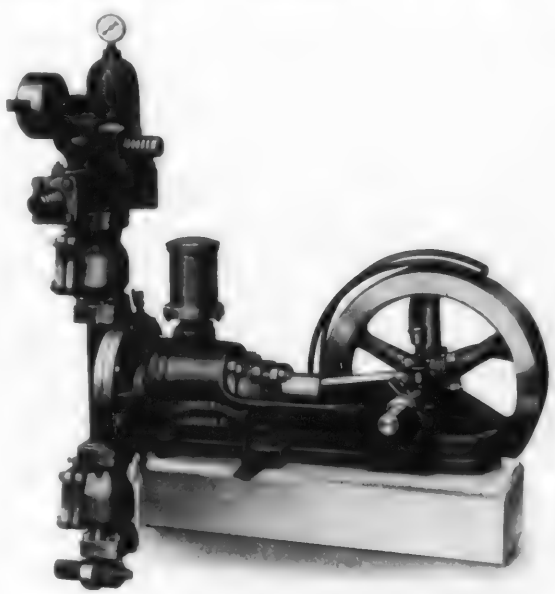


FIG. 7.—Diaphragm pump by S. H. Johnson and Co., Ltd.

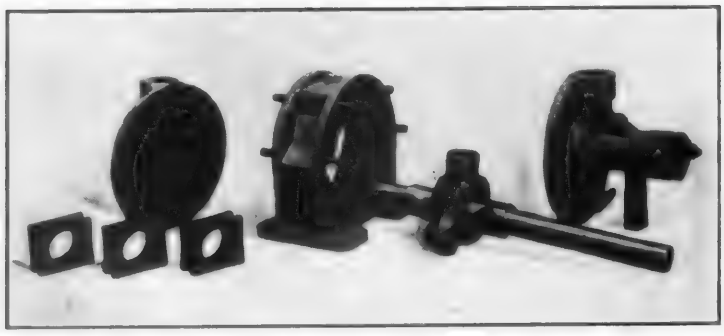


FIG. 8.—The "Penco" Pump, by Pulsometer Engineering Co., Ltd., opened out to show several component parts. The casing in the centre, the two covers to the left and right, the shaft with its triple plungers and three cylinders on the left, form the pump. The plunger unit rides as a sleeve on the shaft eccentric, the cylinders sliding on the faces inside the case, thus allowing the axis of each plunger to be coincident with the centre of the eccentric at all times.

sists of a bulbous three-bladed rotor geared to engage an idler ring with four corresponding pockets. There is also a simple bladed type shown in Fig. 9.

All these valveless pumps are peculiarly subjected to wear, so that it is essential that gritty materials be absent in the paste and creams. This condition cannot always be obtained, as jams contain pips and seeds, and certain chocolates contain crystals of sugar. Efforts to meet this condition are seen in the fitting of separate gears outside the pump and outside bearings.

All modern forms of bladed rotary pump are designed to minimise side and end friction of the blades. Many makers fit an idle rotating member, as in Fig. 9, although another maker manages to do this by an ingenious shape of casing. Even blades of ox shoulder bones have been fitted with the idea that the natural grease of the bone supplied the lubrication necessary. Your highly trained water engineer looks coldly on the rotary pump, no matter how designed, and would install a non-clog form of centrifugal for pumping pastes and creams. He would miss the churning effect by paying too much attention to efficiency and maintenance.

Food machinery is usually designed for rapid dismantling for constant cleaning and sterilising. It should be possible to dismantle without disconnecting the piping, and, as cleanliness is the first law of food manufacture, what has been said concerning the ease of dismantling the pumps applies also to the piping. The piping should be of adequate cross-section to reduce friction losses, be-fitted with flanged joints, and not screwed so that any length of pipe can be removed by sideways withdrawal, the jointing must not be of porous material, there should not be dead pockets, and sterilising by steam should be easy and thorough.

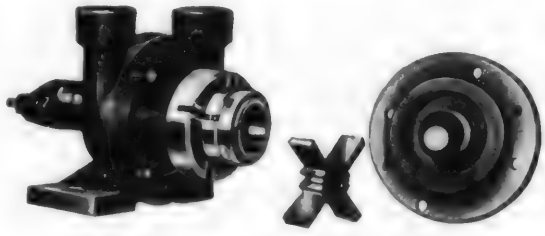


FIG. 9.—The Pulsometer "Centrivac" Pump in which a rotor is set eccentrically in a casing and having two vanes each carried in slots diametrically across the rotor.

THE FUTURE OF POWDERED GOODS

(*Continued from next page.*)

consumable articles with which one does not automatically couple a trade name.

Powders to be used with water or perhaps vinegar for the production of sauces, salad cream, etc., in much the same way that we now prepare mustard, may be a commonplace of the future. Gravy thickeners are the nearest approach to this type of product yet available.

Table Delicacies and Sweetmeats

Leaving the savoury class of goods, we find an equally large field open in the preparation of table delicacies and sweetmeats.

The introduction of "all in" custard and blancmange powders, made with water only, has been threatening for some time, and these might easily become standard articles. Jelly powders of course are legion, but do not seem to be making headway against the clumsier tablet, mainly owing to loss of quality and quantity of flavours in the powder form. This is a difficulty which modern research has to a large extent been able to overcome.

A type of food powder which is worthy of development is that enabling the production of a preserve of the lemon cheese type by means of powder and boiling water, while the reconstitution of red currant, blackberry and other jellies for spreading on bread and for other purposes might also be eminently possible.

Modern methods of drying have done much to remove the prejudice under which powdered goods have for a long time laboured, and surprisingly good results can be obtained in the production of novelties such as those outlined above. The future undoubtedly offers a wide field for enterprise both on the research and the marketing side of food powder production.

THE FUTURE OF POWDERED GOODS

By Lionel J. Dent, B.Sc., A.I.C.

THE IDEA that food science of the future will produce tabloid meals so balanced in vitamins and essential nutritional elements as to form ample and nourishing sustenance has ofttimes been exploited in fiction and in the Press.

While it is perfectly conceivable that concentrates could be prepared which would supply a sufficiency of vitamins and the elements essential to the growth and maintenance of bone, nerve and tissue, we do not yet know of any method of supplying energy and warmth to the human body except by the consumption of food of the necessary calorific value.

In the present state of our knowledge it therefore appears that the nearest practical realisation of this conception of tabloid meals is to be found in powdered foods, where the essential food factors can be incorporated with the necessary energy-forming foods in the most concentrated form.

Powdered Goods versus Canned

From the point of view of the food manufacturer it is evident that our prepared food must be proof against deterioration at any rate over a reasonable period. Now, the conservation of foods, which for centuries has been mainly associated with desiccation, has recently developed along an entirely different path, and the canning process has been applied to every likely and unlikely product. Dried fruit and also vegetables (*e.g.*, peas), which until some few years ago were to be found in every household, have for the moment yielded pride of place to the canned article, and it must be agreed that a more attractive and palatable dish is generally the result.

Two factors have in the main been responsible for this change: first, a saving of time and trouble in preparation, and, secondly, the fact that the dried materials do not reabsorb moisture as quickly and evenly as is desirable. The latter difficulty, however, does not exist to anything like the same extent in the case of spray-dried powders, and the difficulties of preparation are correspondingly reduced.

The advantages of dried powders over canned articles as regards process and handling costs are evident, and this price difference should enable a first-class article to be developed and marketed at a price which would show a big reduction on that of canned goods.

Powdered Food Products

If we glance at the powdered food products which are marketed at the present time we find that surprising progress has already been made towards the establishment of this type of preparation as the most convenient form for proprietary foodstuffs.

As a result of a great amount of research work of a biological, chemical and practical nature, we now have concentrated food powders ranging from those which claim with authority to contain all that is required for the infant's nourishment and growth, to those which are designed to replenish nervous energy or cure "night starvation". It is worth a moment's thought that in the case of the former science has actually provided the complete concentrated food, at any rate for the earliest stages of life. It must be remembered, however, that the newborn babe possesses a store of certain essential materials which are drawn on in the early months and not replenished after weaning.

A number of well-known foods are regularly prescribed by the medical profession in cases of weakness and debility, and there are some which offer a convenient and standardised vitamin supply in conjunction with other valuable food materials.

Beverage powders combining the flavour and food value of cocoa with the diastatic power of malt and the lecithin and vitamins of eggs are in daily use in most homes, and the housewife's task of preparing nutritious and palatable foods has been further simplified by the introduction of prepared powders which when mixed with water or milk and baked will produce puddings, cakes or pastries of first-class quality.

Quite excellent soup powders are already on the market, and although there is plenty of scope for further work in this field there seems no reason why they should not increase in popularity.

Savoury Products

One wonders when a powdered drink of the "beef extract" type will be marketed; a big cost reduction here should result. Ajinomoto is a powdered preparation of a crude but somewhat similar flavour type, and is widely used as a condiment and appetiser in other parts of the world. In the East also huge quantities of curry powder are consumed, and the blending of spices with turmeric for this purpose is a fine art.

Pepper seems to be rather a neglected opportunity for proprietary improvement. Salt and mustard are sold under various advertised trade names, while pepper, giving much more scope for the production of something unique and characteristic, remains one of the very few

(*Continued at the foot of previous page.*)

The OLIDA

By S. Henry Kahn,

(1) & (2) ONE OF the largest and most interesting plants for the preparation of canned foods in the Paris region is that of the Olida company, in which every attempt has been made to mechanise production and so to insure rapidity and evenness in the quality of the goods produced.

The plant includes sections for both meat and vegetable canning, but it is in the vegetable section that mechanisation has progressed to the greatest extent. Certain vegetables, such as peas, are handled entirely by machine, while others, such as spinach, have to be dealt with partly by hand.

Pea Canning

The peas used are of two types, being either mown or picked. In the former case they have first to be threshed to remove the stalks and leaves. Once this is done they can be treated in the same manner as the others. The peas go first to hullers situated on an upper floor, where they are removed from the pods.

As the peas leave the machine they are permitted to drop into a chute, which takes them down to the floor below and feeds them into washing machines. Here the peas are thoroughly washed with water to remove any particles of dirt or impurities which might be mixed with them.

Coming from here, the peas again fall through a chute into the sorting machines situated below, where they are sorted into different sizes. Once this has been done the various sizes are blanched and filled into cans. The plant includes four sets of machines for hulling and sorting the peas, with an output of from 3 to 5 tons per hour for each group.

Descriptions of Illustrations:

(3) & (4)

(1) The hullers on the top floor where peas are removed from the pods.

(2) The washing machines in which the peas are washed with water to remove any particles of dirt or other impurities that might be mixed with them.

(3) The sorting machines in which the peas are sorted into different sizes.

(4) Cleaning spinach, an operation which has to be watched carefully and is carried out by hand.

CANNING PLANT

Our Paris Correspondent

Canning Spinach

In the case of spinach, where it is necessary to watch the cleaning more closely, the operation is carried out by hand. The spinach is placed on tables, where it is examined and any bad portions cut away by women, who also remove the thick ends of the stems. It then goes to a set of washing machines, where it is thoroughly washed twice before being ready for the cooking operations.

The spinach is cooked in large open pans heated by steam, and here the necessary seasoning is added, after which the vegetable is ready for the canning machines.

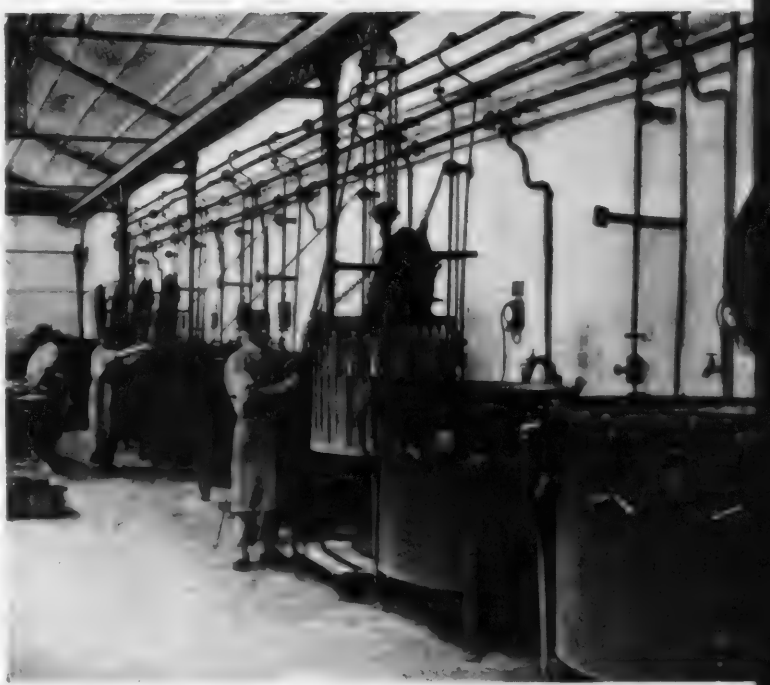
Canning Asparagus

Some more delicate vegetables require treatment entirely by hand. In this class is asparagus, for which the only machines used are the cookers and the sealing machines for the cans. The vegetables are laid on tables, where they are given a first cleaning and paring. They are then soaked for a few moments in water, and are then thoroughly cleaned by washing them in water and brushing them with revolving brushes to remove any traces of dirt or foreign substance. After being rinsed again they are filled into large iron containers pierced with holes, which are lowered into the cookers.

Like the spinach cookers, these are large open pans containing the necessary juice, in which the asparagus remains for the desired length of time. They are then allowed to cool and are removed by hand from the containers and filled into the cans. These are then ready for the addition of the juice and for sealing.

After the sterilisation and sealing of the cans, which is frequently done in a vacuum, the cans are filled into large iron baskets which hold some 500 cans. These are then taken by cranes to the autoclaves, where a final sterilisation takes place. The canning machines have an output of about 4,000 cans per hour.

(5) & (6)



(7) & (8)

Descriptions of Illustrations:

(5) Cooking spinach in large open pans heated by steam.

(6) Cleaning asparagus. Owing to the delicate nature of the vegetable this operation is carried out by hand.

(7) The sterilising autoclaves into which the cans are lowered for final sterilisation.

(8) Examining the cans after sterilisation.

THE USE of RUBBER in the FOOD INDUSTRY

by T. Wood

Recent Developments

DESPITE THE fact that the rubber industry is a hundred years old its advantages are only just being realised by large sections of manufacturers, and there is no doubt that the actual uses of rubber are only in their infancy.

It is the intention of the writer to discuss briefly within the scope of the present article some of the more salient points that arise in the consideration of the application of rubber in the manufacture of food.

The manufacture of foodstuffs is, of course, governed by strict regulations, whilst it is also a matter which creates intense public interest. The problem of hygiene is one which the food manufacturer has had to study for many years, and the introduction of rubber into the manufacturing equipment of a food factory is one that is of considerable interest.

Special Qualities of Rubber

To show very clearly the special qualities of rubber in connection with the manufacture of foods, a brief summary of the main qualities is given below:

(1) Hygiene.
(2) Elasticity.
(3) Durability.
(4) Tastelessness.
(5) Abrasion resistance.
(6) Fadelessness (except when exposed over a period to strong sunlight).
(7) Shock-absorption.
(8) Insulation.
(9) Acid-resistance.

The value of many of the above items—namely, 1, 3, 4, 5, 6 and 9—will readily be seen when viewed from the point of view of the food manufacturer. One of the chief factors in the hygienic properties of rubber products is, of course, the fact that it can be thoroughly sterilised without ill effect, and in rubber-lined tanks there is no danger of dirt or residue remaining in the corners, a factor which has, in the past, been a disadvantage in certain types of metal tanks.

Durability, elasticity and abrasion-resistance are, of course, allied. They prolong the life of the tank—or other article, a brief line-up of which will be quoted in a later paragraph—and whereas a sharp blow can, and often does, injure tanks made of metal or porcelain, etc., rubber will stand up to hard treatment which would be impossible with other materials. It is this serviceability over a long period of years which must eventually bring about a conversion towards the use of rubber manufacturing components.

There is (Item 4) no danger of the food in preparation reacting on the rubber and absorbing any tang or taste, whilst its insulating qualities ensure safety when certain electrical processes are in operation.

In Item 9 it should be mentioned that certain treatment has to be given to the rubber when in preparation before its acid-resisting properties are developed. Some rubber goods are affected by certain acids, and rubber should not be used in these circumstances, unless it has been obtained with a view to acid-treatment. It is perhaps necessary to say that before being finished, rubber goods consist of a mix of crude rubber with certain chemicals; this is vulcanised or baked to the required hardness, which varies according to the use to which the article is to be put.

Some Examples

The writer has stated that there are a number of articles used in the manufacture of foodstuffs that are made partly or entirely of rubber, and in this connection a brief description of some of the more important articles may prove of interest.

Milking Rubber Equipment. Possibly one of the biggest uses of rubber in the manufacture of food is for rubber milking equipment used on mechanical milkers, which are now in operation almost universally. Rubber is used in this case because of its flexibility and softness; the rubber parts such as the teats and tubing being usually sterilisable, thus ensuring no contamination of the milk.

Milk Bottle Caps. In Canada particularly the use of rubber milk bottle caps is now being exploited. These are perfectly airtight and are not susceptible to damage. The fact that they can be attractively printed lends additional value to them as an advertising and sales medium. Their durability, of course, extends to several years, and in view of this it is reasonable to anticipate that the cost as compared with the present cardboard stopper will be more favourable.

Manufacture of Chocolate. Rubber moulds are used extensively on the Continent in the manufacture of chocolate, it being found that the flexibility of the mould facilitates the rejection of the chocolate after the moulding operation. As a matter of interest it is worthy of note that this type of mould was used some years ago in this country, but has now been almost generally superseded by rigid metal moulds. The reason for this change from rubber to metal is that the latter is considered more satisfactory for handling purposes.

Rubber Gloves. All readers will be familiar with the use of rubber gloves, which can be obtained to cover practically any field. Apart from the well-known household glove, surgeon's glove and electrician's glove, rubber gloves are now being used in dairies and other places where food is handled. These gloves, which can be obtained in a thinner material than any form of fabric glove, prove ideal for food handling in view of the fact that they do not impart taste of any kind. Various types of mitts and gauntlets are also produced to-day which are made of the highest quality acid-resisting rubber (although they are made of a soft and pliable texture). They not only resist corrosion but are durable against abrasive wear. It should be mentioned here that nitric acid and sulphuric acid will deteriorate the rubber in time.

Belting. Conveyor belting used in the food industry provides a sanitary, easily cleaned surface for carrying vegetables, fish, fruit and other food products. Belts can be made with a white surface to facilitate sorting. They are, of course, perfectly waterproof and impervious to the entrance of vegetable and fruit juices. Needless to add, the ingredients of the belt are tasteless and non-poisonous. The application of these belts promotes cleanliness, as any impurity immediately shows up on the surface, while washing is easily and quickly accomplished with a brush, lukewarm water and soap.

When ordering belts the width, length and number of plies should be specified (3-ply is most commonly used for light materials on short conveyors, and 4-ply is advisable for bottles). In order to avoid any mistake, and to ensure absolute co-operation with the belting manufacturer, it is also advisable at the time of ordering to specify the spacing of the rollers, the diameter of the pulleys and the materials to be handled.

The Treatment of Belts. Before being used any new belt should be washed. When used for carrying raw vegetables or fruits a new belt should be washed with an alkali soap or with a 5 per cent. solution of caustic soda in order to remove the slight sulphur deposit on the belt face. Manufacturers also usually recommend the washing of a belt after a shut down that has lasted more than 48 hours.

The Value of Rubber in Food Manufacture

The examples quoted above show to some small extent the various applications of rubber in the food manufacturing industry. Rubber can be applied in a huge multiplicity of ways with a resulting increase in the life of the equipment and a high degree of hygiene. The point the writer wishes to stress here is one which is often overlooked, and that is, that rubber can be mixed with so many different forms of chemicals and colouring agents that practically any particular quality can be reproduced at a reasonable cost.

The Life of Rubber

The life of rubber in any industry is bound, of course, to vary considerably with localised conditions. One can, however, say that the life should compare favourably with that of metal or wood providing the following elementary rules are observed:

(*a*) Sunlight is an enemy of rubber and causes fairly rapid ageing.

(*b*) Rubber should be kept at an even temperature and, unless it has been specially manufactured to withstand a high temperature, an endeavour should be made to keep it at a normal temperature throughout. Excessive cold or excessive heat will deteriorate the quality in due course.

(*c*) Oil and grease should not come into contact with rubber unless it has been made oil-resisting.

Some Likely Developments

Several possible developments have already been mentioned, but there are many that have not yet been fully considered by the manufacturer or the user. It is a point of importance to remember that the rubber industry is constantly searching for fresh outlets, while experimentation is being continually conducted in various directions. The food manufacturer will readily admit that a product having the many properties of rubber can be adopted *economically* for various purposes, but under present conditions it is possible that many of these uses have not been exploited. Any rubber manufacturer will, however, experiment gladly on any item suggested by the prospective customer.

One important development that, in the view of many authorities, will shortly be exploited fully, is that of the use of rubber-surfaced tables and benches for food factories. The simplicity of keeping such surfaces absolutely clean is a big point in their favour. The elimination of the possibility of "chipping", as with wood and certain metals, is another important factor in this connection.

In view of the adaptability of rubber in all directions of the food industry, it will be to the considerable advantage of the manufacturer to study the qualities and, with his expert knowledge, to judge where rubber is likely to be at once more serviceable and more durable than products at present in use. The comparatively recent development of adhesive (or rubberised) tape to ensure perfect airtightness in tinned commodities is an example of the way in which manufacturing requirements can be met by the rubber industries.

Types of Rubber Products

Before concluding, it is as well to look at the various types of rubber that are in use. The hard rubber (ebonite) for tank linings, etc., is very different from the soft, pliable rubber needed for the passage of certain liquids, which in turn differs considerably from rubberised tape.

It is important to remember that rubber products are manufactured with the aid of different chemicals, which can be altered to meet any special requirements in the way of heat-resistance, pliability (or inflexibility, its reverse), hardness or softness, etc. This is a fundamental reason for the adoption of rubber materials for manufacture, while it is important to realise that because of its preparation in its raw state (unlike wood and metal) rubber can be moulded into every conceivable shape and size. Mass-production methods in the rubber industry have, moreover, been developed to the utmost, thus making competitive, and often very low, prices possible.

INDUSTRIAL NEWS

National Food Canning Council's New President

Mr. H. D. Gregson, who is Canning Manager of Foster Clark, Ltd., of Maidstone, Kent, was elected President of the National Food Canning Council for the ensuing year at the annual meeting held in Liverpool on Wednesday morning, November 4, in succession to Mr. A. Ll. Matthison, who retired.

Mr. Gregson has been intimately concerned with canning for a number of years, having studied the subject in Canada. He has been Canning Manager with Foster Clark since 1928, and a member of the National Food Canning Council since its inception. Nevertheless, he is yet a very young man, being only 32 years of age, and he brings to the canning industry and to the Council a young and alert brain, and a keenness to further the interests of the industry.

Mr. H. D. Gregson.

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Mr. Rex Campbell has changed his name by deed poll and wishes to be known as Reginald Gordon Wrugh. The business of which he is Managing Director will, however, continue to be known as Rex Campbell and Co., Ltd.

Ideal Home Exhibition

The Twenty-First Ideal Home Exhibition will open on April 22, 1937, and will run for ten days longer than is usual until May 29, 1937, so as to cover the period of the Coronation celebrations.

Obituary Notices

We regret to announce the deaths of the following:

On November 4 Lieut.-Colonel Walter William Wiggin. At the age of twenty-two he entered his father's business, that of Henry Wiggin and Co., Ltd., of Birmingham, ultimately becoming a director and finally chairman in 1916 on the death of his elder brother, Sir Henry A. Wiggin, Bt. He retired in 1920 when the business was merged with the Mond Nickel Co., Ltd.

Dr. Gustaf Schack-Sommer, aged 82. He was largely responsible for the establishment of a beet sugar industry in Britain, and was associated with the British Sugar Beet Council until the beet sugar factories came into being.

Recipes for Canned Foods

A series of recipes designed "in the interests of a better understanding of canned fresh foods and their value" have been prepared by the Metal Box Co., Ltd. They deal entirely with British canned foods, the preparation of which has become in the last five years one of our major industries. The actual recipes are on single sheets of art paper attractively designed and illustrated and having, in some cases, colour pictures of the canned product. The brochure is so designed that further recipes can be added to it as they are published.

An impression of the gathering at the reception given by Leonard Hill Limited, to mark the successful introduction of a new publication, *The Manufacturing Perfumer*. In the foreground, from left to right, may be seen Mr. Robert Dyas (of J. Grossmith and Son, Ltd.), Mr. W. A. Poucher (of Yardley and Co.), Mr. Roger Allen (of Stafford Allen and Sons, Ltd.), Mr. F. P. Walton (of Elizabeth Arden, Ltd.), Mr. W. Leonard Hill, Mr. W. Pickering (of Rotoplunge Pump Co., Ltd.), Mr. Bertram Ward (of the Technical Advertising Service), Dr. W. L. Davies (of the National Institute for Research in Dairying), Mr. T. McLachlan, and Dr. C. I. B. Voge. Others who accepted invitations included: Mr. T. Morris (University of Cambridge, Food Investigation Department), Mr. E. B. Dewberry, Mr. E. B. Bennion (Borough Polytechnic), Mr. C. B. Ridley (Brewers and Bottler's Supply Ltd.), Mr. T. H. Fairbrother, Mr. F. Gerrard (John Russell and Co. (Meat Salesmen), Ltd.), and Mr. R. Levi (London Press Exchange). Mr. W. Leonard Hill (Chairman), Mr. Keith Fraser (Advertising Manager), and Mr. G. W. Lacey (Managing Editor) acted as hosts.

Exhibition of Electrical Material

The remarkable extent of the range of electrical installation material available at the present time is revealed at the permanent exhibition at the General Electric Company's headquarters, Magnet House, Kingsway, London, W.C. 2. The space allotted to the exhibition is on either side of the main entrance. New products will be introduced as they become available.

New Condensed Milk Factory

Robert Morton and Co., Ltd., of Burton-on-Trent, are equipping a new Co-operative Wholesale Society condensed milk factory at Fole, near Uttoxeter. Production of condensed milk will amount to 500 gallons from 1,500 gallons of milk in 2½ hours.

New Works Building

A new building is being built at Speke for Thompson and Capper Wholesale, Ltd., and Manesty Machines, Ltd.

Owing to the great expansion of business during the past few years, these two companies recently purchased 7 acres of land in the new industrial area at Speke, and it is on this land that the new buildings are being erected. They will have a floor area of about 30,000 sq. ft., and will be fitted up with the latest machinery for the speedy production of the Manesty Water Stills and the Manesty Tablet Machines and all the other machinery made by this company, a special feature being made of the punch and die-making department, which will be one of the most up-to-date in the country.

TRADE LITERATURE RECEIVED

Mixers and Dryers

L. A. Mitchell, Ltd., 37, Peter Street, Manchester, have sent us a set of their latest leaflets describing their fluid mixers and stirrers, drying plant, chemical and process plant. A number of their machines are suitable for the food industries, and the illustrations include continuous conveyor-type driers at a well-known cider manufacturer's works, stirrers in a fruit drinks factory, etc.

Laboratory Apparatus

Griffin and Tatlock, Ltd., have sent us leaflets describing new apparatus. They are (1) *Sand's Electrochemical Apparatus.* All the following important estimations are possible on the new Sand's apparatus: Accurate estimation of small or large quantities of metals — *e.g.*, Cu, Pb, Bi, etc., Titrations using a voltmeter as "end-point" indicator, *p*H Determination, Conductivity of solutions. (2) *Modern Distillation Methods.* Apparatus designed to improve the accuracy, increase the rapidity, and simplify the technique of important analytical control estimations of aqueous and other liquids. (3) *Sulphur Dioxide Determination.* A standardised apparatus for the estimation of SO_2 in starch, gelatine, dried fruits and meats, etc. It is of wide application and of use in other spheres than that of food analysis. (4) *Turbo Stirrers.* New designs of remarkable efficiency. Vigorous agitation, perfect emulsification, rapid evaporation by selection of the appropriate type. Example: In an aqueous vehicle, the Turbo-Agitator will disperse *sand* in a state of violent motion.

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Information which may interest Sales Managers is included in a leaflet received from the National School of Salesmanship, Ltd. Salesmen are trained, and if you decide to employ one of these men the National School of Salesmanship guarantees his efficiency and backs this guarantee with cash.

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A new leaflet relating to wood tanks and vats has been published by S. Briggs and Co., Ltd., Burton-on-Trent. Tanks can be constructed in standard sizes for capacities from 50 to 50,000 gallons or larger to meet special requirements. Wooden tanks and vats have been supplied for a great variety of liquids in cider factories, dairies, food product factories, etc.

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Fosters of Bardney, canners of English grown peas, fruits, and vegetables, have issued an attractively produced price list for their 1936 pack.

Lady Maureen Stanley, making her speech when she opened the Imperial Fruit Show and Canners' Exhibition at Liverpool on October 30 last. The Lord Mayor of Liverpool (Councillor R. J. Hall) is seated on her left. A full report of the Exhibition, which was held from October 30 to November 7, was published in *Food Industries Weekly* on November 6, and a final report on November 13.

Silvertown Oils

Besides oils and greases for all machinery purposes, it is seen from the latest booklet of Silvertown Lubricants, Ltd., that they also market several grades of mineral oils suitable for use in the manufacture of certain types of disinfectants, light mineral oils for the manufacture of floor oil, and a range of specially prepared mineral oils of varying characteristics for the manufacture of insecticides, fungicides, horticultural sprays, emulsions, etc.

The booklet also contains useful scientific and engineering data: comparison tables of Fahrenheit and Centigrade temperature scales; conversion tables with a list of multipliers and reciprocals; units and their equivalents; electrical definitions; and data concerning the horse power of petrol engines.

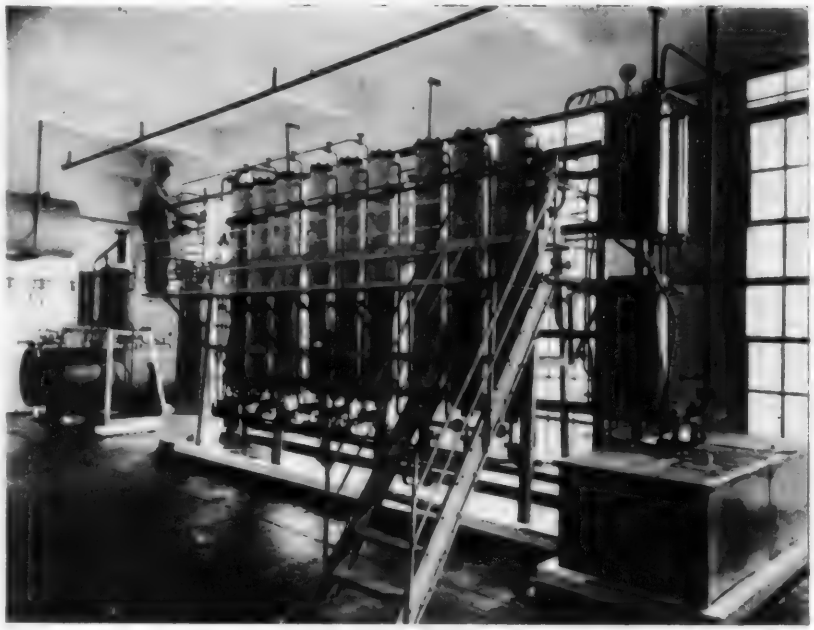
Rotex Screener

An attractive catalogue issued by Lockers (Engineers), Ltd., Warrington, contains the names of more than 1,200 companies that use Rotex Screeners, a list of materials which are successfully screened with the machines, numerous illustrations of installations in works, and finally a description of the machine itself. It carries out mechanical separations according to particle size, and is made with from one to five superimposed screen surfaces in a number of sizes for various capacities. Each screen surface is flat, is mounted on an individual screen frame at a normal angle of four degrees, and is provided with an individual mesh cleaning device insuring uniform, continuous separations. The entire screen unit is completely dust-tight when assembled. The machine is available in a wide range of models and can be adapted to wet screening.

PLANT AND MACHINERY

Photo-Electric Colorimeter

A new model of the Bolton and Williams Colorimeter has recently been introduced for measuring the colour of any opaque plain surface, whether glossy or matt. This instrument may also be used with powders, pastes, or opaque liquids. It measures the percentage of various pure coloured lights reflected by the surface, the coloured lights chosen being spread through the spectrum. The results are independent of the idiosyncrasies of the human eye and are reproducible. The instrument is very sensitive, and will readily distinguish between colours so close in quality and hue as to be barely distinguishable by eye. The instrument should prove of value in such fields as the colour measurement of fats, meat pastes, creams, and other emulsions such as mayonnaise, soups, sauces, flours, starches, and other powdered goods. The fading of colours through exposure may also be measured.



A T.R.W. Continuous Hydrogenation Plant for hardening vegetable oils, supplied to Consolidated Oil Products (Pty.), Ltd., of South Africa by Technical Research Works, Ltd.

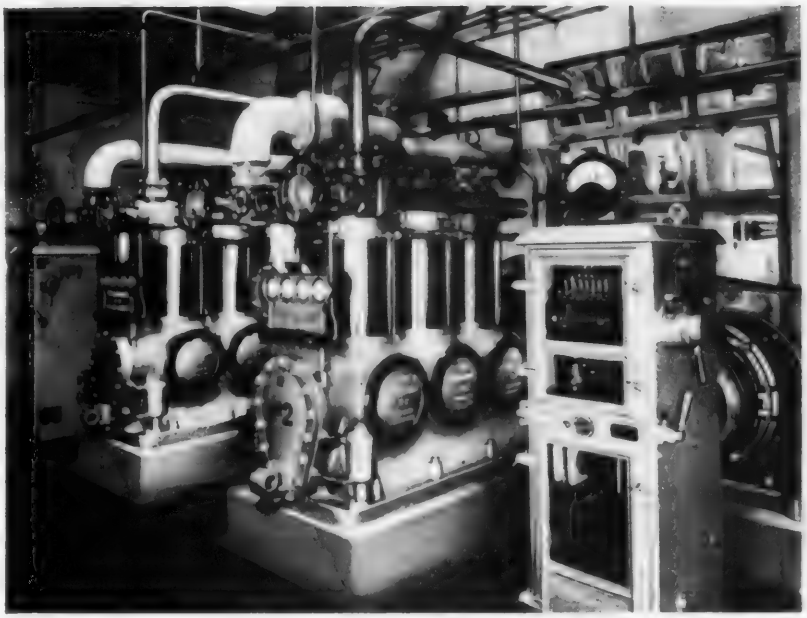
"Staybrite" Steel

"Staybrite" Super Rustless Steel finds many applications in the food industries, and the latest publication of Firth-Vickers Stainless Steels, Ltd., deals with its application in the dairy and ice-cream industries. Mineral water manufacturers are using it for polished pans and stirrer gear for holding and mixing fruit syrups and juices. A new design of "Staybrite" steel steam jacketed pan has been evolved by a well-known firm for the making of sauce, etc. Castings of this steel are being used for filter presses, and the cylindrical type of filters are being built from "Staybrite", including the wire cloth. There are also improved "Staybrite" steel milk pasteurisers now on the market. Two pasteurisers of this material are being supplied to the British Government at Malta.

The engine-room at the Independent Milk Supplies, Ltd., Marylebone, showing three Vertical High-Speed Ammonia Compressors, by J. and E. Hall, Ltd.

New Filling Machine Fitment

A recent development of the Automatic Weighing and Packing Machine Co., 22, Caroline Street, Birmingham 3, is the development of a simple and convenient method for the reduction of the drive in their small filling machine. On all machines for filling powdered or granular materials where the method of filling is through an intermittently rotated worm or through a controlled aperture, as in automatic weighers, it is necessary to stir or agitate the contents of the hopper. Normally the stirrer is driven direct from the worm-driving mechanism and at the same speed. If the drive is at a slower speed than the worm the quantities filled are more accurate. The new fitment now incorporated in these filling machines enables the stirrer to rotate at a slower speed than the centre worm spindle.



(By courtesy Messrs. Cadbury Bros., Ltd.)

Refrigerating plant installed by the U.D. Engineering Co., for Messrs. Cadbury Bros., Ltd., incorporating 2 "Udec" 3-cylinder No. 9 type ammonia compressors working in conjunction with shell and tube evaporators and condensers. The plant operates under the "Udec" flooded evaporator system incorporating automatic control of the refrigerant. The plant is used for milk cooling duty—the maximum capacity being equivalent to 1,700,000 B.T.U. per hour.

Potato Peeling Machine

A small bench type potato peeling machine with a capacity of 10 lb. per minute is a recent introduction of the Peerless Electrical Manufacturing Co., Ltd. The company has had larger capacity models on the market for some years, but it became apparent that there was a market for a small compact machine of good design and selling at a reasonable price.

Blackstone Diesel Engines

Creameries, fruit stores, and hop drying plants are some of the branches of the food industry employing Blackstone Diesel Engines for power units. An interesting installation is at a large apple store where Blackstone engines provide power for driving refrigeration machinery. Many flour mill installations have been carried out, while creameries also employ these engines, in many instances to drive "Unchokeable" pumps, also made by Blackstone and Co., Ltd., Stamford, for transporting milk from one part of the works to another. These pumps will carry semi-liquid fluids from place to place economically, and for this reason have been installed by chocolate manufacturers for conveying purposes.

Sausage Factory Equipment

J. C. Wetter and Co., 23, Middle Street, West Smithfield, London, E.C. 1, have during the past year or two installed plants in some of the largest and most up-to-date sausage manufacturing plants in this country. The company produces machines of many types for the manufacture of sausages and cooked meats of every description.

The "Saxonia" Giant Electric Meat Grinder, with a mincing capacity of 5 tons per hour, is the largest machine of this description ever made. The reinforced knives and plates of special quality working on the shear-cut principle are capable of cutting frozen meat through ¾ in. hole in one operation. The Twin Filling Unit is suitable for filling all kinds of pasty or semi-liquid substances into tins or glasses in a continuous process.

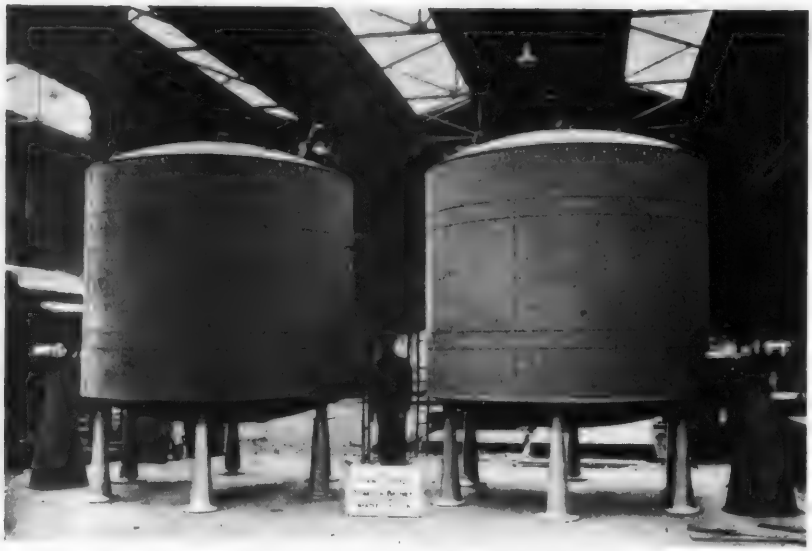
Conveyor Weigher

Where either raw or finished materials are carried on some form of endless conveyor between processes and departments it is often advantageous for managerial control to know the weight of goods passing along the conveyor during any period of time. The "Weightagraph" made by Adequate Weighers, Ltd., 382-8, Euston Road, London, N.W. 1, enables this to be done and gives a detailed graph of the working of a conveyor. The company are hoping soon to apply this instrument to weighing light loads, which would make it particularly suitable for the food industry.

Portable Stacker

The Collis Portable Stacker, made by J. Collis and Sons, Ltd., 42 and 43, Regent Square, Gray's Inn Road, London, W.C. 1, is primarily for the tiering of packages to utilise the otherwise wasted space between floor and ceiling. It is also used for many high-lift operations, such as the elevation of biscuit cutting cylinders, boiling pans, dough troughs, etc. It incorporates so many fundamental improvements that it is publicly exhibited at the Home Office Industrial Museum of Safety Appliances, 97, Horseferry Road, Westminster, London, S.W. 1.

The latest installation carried out by L.C. Engineering Supplies, Ltd., at Smedley's Lady Dane Cannery at Faversham, Kent. The pressure retort can be used for processing vegetables, fish, meats, cream, milk or soup.



Two 3,000 gallon stainless steel vertical milk storage tanks complete with agitator and motor, manhole, anti-foam inlet and access ladder by Thompson Bros. (Bilston), Ltd. The tanks are lagged all over with 2 ins. of cork and have bright polished interiors.

Toggle Lidding Machine

The Metal Box Toggle Lidder has been designed and produced to facilitate the closing of lever lid, slip lid, and shoulder type cans. The toggle action of the closing head imparts a gradually decreasing movement towards the end of the stroke, and this produces a very steady squeezing action instead of a destructive blow. The machine is foot operated, and so designed that it can be used with travelling conveyor band.

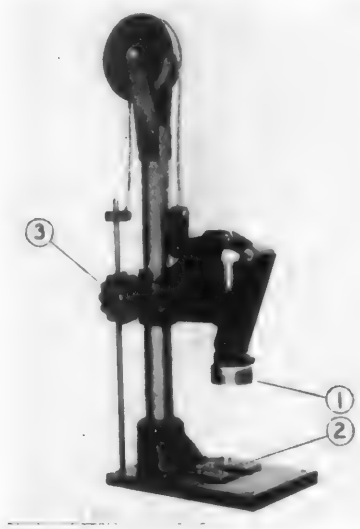
The chuck (1) in the picture on this page is shaped according to the style of the tin. The height adjustment for different sizes of tin is accomplished by raising or lowering the head by means of the hand wheel (3)—the head being locked in position by means of a locking nut. The tin with the cap or shoulder loosely applied is placed on the guide plate (2), and by depressing the treadle the toggle actuated closing head is brought down, completing the closure. A perfect closure is thus formed without collapsing the tin.

Monel and Inconel Plant

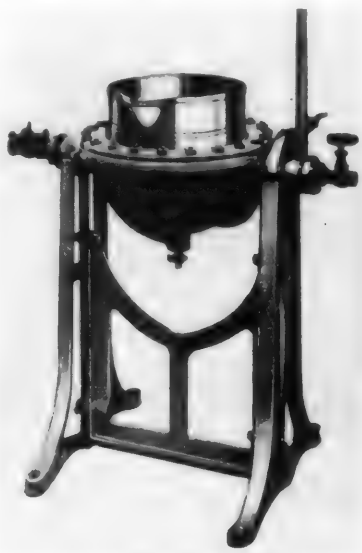
John Thompson (Dudley), Ltd., Windmill Engineering Works, Dudley, inform us that they have found considerable "liveliness" in the foodstuffs industry with regard to plant constructed of stainless steel, Monel metal, nickel, and inconel. They have recently constructed a jacketed boiling pan in Monel metal with an internal diameter of 9 ft. 7 in., which is the largest Monel metal vessel ever manufactured in this country. The company is at present at work on what is the largest order for inconel ever placed in this country, and the 9 ft. 7 in. vessel now being made in inconel is the largest inconel vessel ever ordered in this country. All this special plant is welded by the electric metallic arc process.

Recording and Controlling Instruments

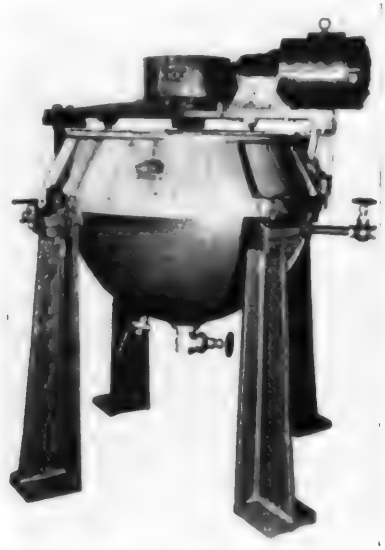
The Cambridge Thermometer Regulator, made by the Cambridge Instrument Co., Ltd., is a compact, self-contained regulator which can be employed for automatically controlling the temperature in a wide variety of applications at any point between the limits of -10° and $+800^{\circ}$ F. The Cambridge Temperature and Humidity Recorder is designed for use in industry where humidity is of importance, such as conditioning rooms and process rooms in granaries, flour mills and bakeries, and storage rooms for foodstuffs—e.g., butter and eggs, fruit and grain, etc.



The Metal Box Toggle Lidder mentioned above.



A small stainless steel jacketed tipping pan for preparing jam, sauces, confectionery, etc., by Metal Propellers, Ltd.

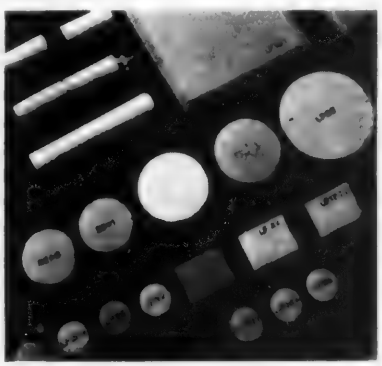


Copper mixing pan 36 ins. diameter by 26 ins. deep with direct geared motor drive by William Brierley. Collier and Hartley, Ltd.

Porous Ceramic Filtering Media

The Royal Doulton Potteries announce that they are now in a position to supply *porous ceramic* industrial filtering media, for which they claim resistance to all acids (except hydrofluoric) at all temperatures and concentrations, good mechanical strength, regulated permeability and porosity to suit the nature of the residue to be retained, and adaptability for use in various types of filtering apparatus. Porous ceramic materials for filtration and diffusion have been extensively used on the Continent, but hitherto British manufacturers have had to import these materials.

Another recently introduced material offered by Doulton and Co., Ltd., is their white chemical stoneware for storage vessels, tanks, pipelines, taps, etc.



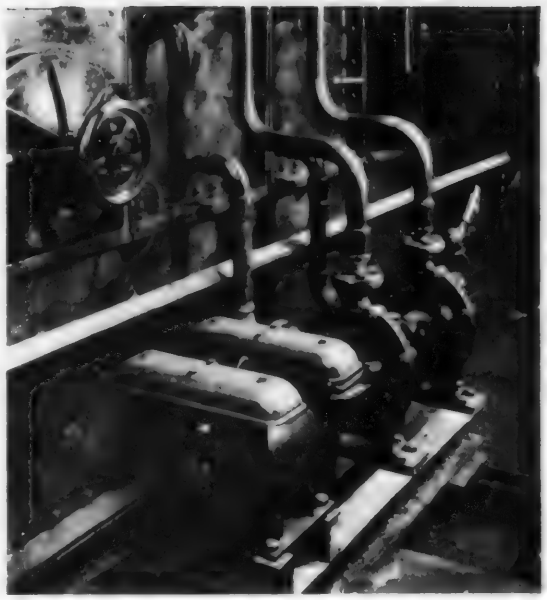
A group of porous ceramic filtering media by Doulton and Co., Ltd.

Multi-Leaf Auto Filter

The Multi-Leaf Auto Filter of Wolfe Keene and Co., Church Street, Hull, comprises a series of leaves, usually all metal, which are in hydraulic communication at their inner edges with a hollow shaft around which they are spaced and carried equally apart at an angle, and housed inside a casing suitable for a pressure of 30 to 50 lb. per sq. inch, in which the liquid to be filtered is pumped. This filter has been designed to provide in a simple and quick manner, not only accessibility of the filter leaves for renewal of the filtering medium, but also thorough cleansing with but one spray wash in operation. The filters can be constructed in single, double, or quadruple phase of leaf assembly and up to 1,000 sq. ft. total area. They can be used for filtering sugars, syrups, juices, jellies, and vegetable products, as well as their suspensions—water, hot saturated liquors, slurries, oils, spirit, etc. This filter is an improvement on existing types, and was described in the proceedings at the Chemical Engineering Congress of the World Power Conference held in London this summer.

Cowl Ventilated Motors

An increasing number of cowl ventilated motors are being supplied by Laurence, Scott and Electromotors, Ltd., for use in dairies and similar situations where conditions are likely to be damp. In many processes water or other fluids may splash from the plant, the atmosphere may be damp or steam laden, or even when the surroundings may be normally dry, the plant may be washed or hosed down periodically. The protection, as will be seen from the illustration on this page, is proof against moisture dripping or splashing from almost any angle, and even hosing the adjacent plant is not likely to cause trouble with the motor if reasonable care is taken to keep the jet off the machine itself. The machines have high grade insulation, in which mica plays a prominent part, and since there is a constant circulation of air through the motor trouble from condensed moisture is unlikely.



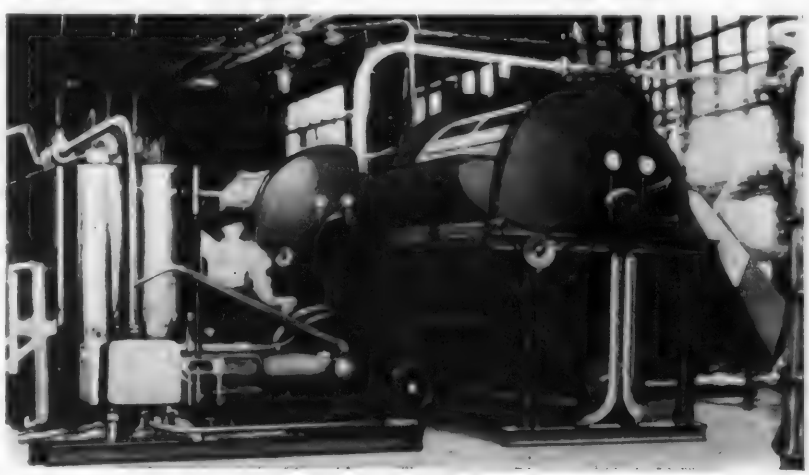
A cowl ventilated motor by Laurence, Scott and Electromotors, Ltd., driving pumps.

Dust Removal in Industry

For a very wide range of industrial applications, the most efficient method of removing dust particles from air (or gas) is the electrostatic. In this method the dust-laden atmosphere is caused to travel through towers or compartments provided with a series of metal plates or pipes, known as collector electrodes, which are earthed. Between these plates or in the pipes hang rod or wire discharge electrodes connected to a high tension (about 60,000 volts) direct current electrical supply. Consequently a corona discharge takes place from the wires and all the dust particles are electrified and repelled towards the earthed collector electrodes. These are generally provided with motor-driven rapping hammers to shake off the accumulated dust, which falls into suitable hoppers below, while the air or gas passes on entirely free from dust.

The electrostatic method has been developed to a remarkable degree by the pioneer company Lodge-Cottrell, Ltd., of Birmingham and London, the average efficiency claimed for the plant being 95 to 98 per cent. dust removal.

This section dealing with Plant and Machinery will be continued in the next issue.



A plant installation showing two filters by Wolfe Keene and Co.

DRIED FRUITS

Methods used for drying fruits, including sun-drying and dehydration, sulphuring and their keeping properties are discussed.

THE DRYING of fruits has been practised since very early times, and in spite of the advent and progress of canning and bottling, there is still a large tonnage of fruit preserved in this way every year. The industry is as old as that of smoking and curing, the only difference between modern methods and the old ones being that whereas formerly drying by exposure to the sun was practised exclusively, a large proportion of fruit is now dried artificially by the application of heat from coal, gas, or other fuel. Sun drying of certain fruits in tropical and semi-tropical countries is still practised, and it is frequently claimed that the products so prepared are better than the same fruits dried by artificial means. The production of dried figs and dates has varied but little in the course of hundreds of years, and we still read of the latter, after being dried in the sun, being filled into a hole in the ground and trodden down by the bare feet of natives.

Before passing on to the consideration of the methods of drying fruits, it will be as well to discuss a few fundamental points upon which the successful preservation of fruits depends.

General Considerations

In its natural state vegetable material usually contains appreciable quantities of water, varying probably from 90 to 50 per cent., and if fresh fruits or vegetables are kept in the ordinary way, enzymic changes take place, causing partial breakdown of the tissue. At a later stage various organisms, which may be yeasts, moulds or bacteria, attack the material, causing ultimate complete disintegration. Not only does the development of these organisms depend upon an adequate amount of moisture, but also the enzymes in the plant tissues are either restricted or inactivated when the moisture content is reduced to a low limit. If we take fruit as an example it will be seen that the percentage of moisture may be reduced by either evaporating some of the water by the application of heat, or by adding some material such as sugar or glycerine which does not itself contain water. The first alternative is, of course, the one which is used in the drying of fruits, but the second is mentioned as it is the basis of jam and jelly manufacture, and fundamentally is very similar to the process of drying, in that the ultimate end is to reduce the percentage of water. If apples are preserved by drying, a satisfactory product is attained when the moisture content is reduced to about 20 to 24 per cent. Similarly, if sufficient sugar is added to apples to give a final sugar (or total solids) content of about 75 per cent., the amount of water left is 25 per cent. The same result, therefore, as regards moisture content is attained in both cases, and whether the fruit is dried or made into jam, the same preservative effect is achieved.

The reduction of moisture content to a level of 10 to 20 per cent. is the basis of preservation by drying, but there are many other factors which have to be taken into account. First, the preparation and drying of the fruit must be carried out in such a way as to prevent or restrict the activities of oxidising enzymes which may cause serious discoloration of the product. Further, the rate of drying is a very important factor in producing dried fruits of the correct texture and appearance. If the drying is too rapid the surface tends to become hard, thus forming an almost impermeable coating over the centre of the fruit, which may remain quite moist and soft. This is known as case-hardening, and will be referred to again later.

Another point which requires careful attention is the amount of preservative which is left in the fruit. In some countries no preservative at all is permitted, whereas in others sulphide dioxide varying between 1,000 parts per million in France up to 2,500 parts per million in Canada is allowed. Like all natural material for manufacturing purposes, the packer of dried fruits has to contend with the varying physical properties of the fruit, not only from season to season but from delivery to delivery, and no set formula for dealing with the material can be formulated. Fruit grown in one field may be very different from fruit grown in an adjoining field as regards its power of absorption of sulphur dioxide during the sulphuring process, and, again, the same fruits may vary considerably in their ability to lose sulphur dioxide during the drying process.

Sun Drying

Figs, dates, raisins and sultanas are probably the best-known sun-dried fruits. The first two of these are picked either dead ripe or actually having fallen to the ground, and are spread in layers exposed to the sun. They are turned frequently, and are usually dried sufficiently (that is, to about 15 to 20 per cent. of water) in about 10 days. Generally the fruit is then stacked in bulk for two or three months in order to mature, and then packed into boxes ready for shipment. In the case of raisins, these are allowed to remain on the vines for some time in order

that a certain amount of drying out may take place, and at the same time a certain amount of enzymic changes occur in the sugars. Raisins and sultanas are often dipped into a bath of alkali (lye bath) containing about 2 per cent. of caustic soda. This removes the bloom and produces the characteristic appearance of the skin of these two dried fruits. Sultanas are usually sprayed during the drying process with a mixture of olive oil and potash, to which sometimes certain flavouring materials, such as rosemary, are added in order to produce a bouquet. This spraying treatment softens the skins and helps to preserve the fruit. As a rule, sun-dried fruits are not sulphured, but when sulphuring is practised it is carried out by the same process as for artificially dried or dehydrated fruits. Being a natural process the control of the drying is very limited, and from this point of view sun drying is inferior to the dehydration process.

Dehydrated Fruits

The drying of fruits by artificial heat is preferable in many ways to sun drying, and the process has made it possible to successfully dry such fruits as apples, peaches, pears, etc., which are, for various reasons, unsuited to the sun-drying process, and which do not grow to any extent in climates where sun-drying would be practicable. With sun drying there are considerable losses due to respiration in the first few days' exposure, but by the artificial method the time of drying is reduced from several days to a matter of a few hours, and these respiration losses become negligible. The yield of dried fruit by the evaporation method is therefore always considerably higher than by sun drying. With most fruits 5 parts of fresh fruit will yield about 1 part of evaporated fruit; with apples the yield is somewhat less than this. Fruit intended for drying is usually prepared in a very similar way to that for canning, except that on the whole more fully ripened fruit is used. Blemished and faulty fruit should be excluded, and grading should be carried out more on a basis of degree of ripeness than of size. In the case of apples, pears, peaches and apricots, a certain amount of preparation, such as peeling, coring, slicing, dicing, etc., may be necessary, and with the two former, which oxidise and discolour very quickly after cutting, it is either necessary to give a preliminary sulphuring or, alternatively, to place the cut pieces immediately in a weak (about 2 per cent.) solution of salt. Peaches are usually dipped in a lye bath in order to remove the skin, but apricots are as a rule not peeled before drying.

Sulphuring

After preparing, as described above, the fruit is placed in trays—either wooden or woven galvanised wire—and stacked on trucks in such a way that there is a good even space for ventilation between the trays. The trucks are then transferred, with as little delay as possible, to the sulphuring chamber, which usually consists of an airtight chamber of brick or concrete, in the floor of which is a pit in which the sulphur is burnt. The chamber is fitted with a suitable air inlet shaft and outlet, both of which can be controlled. About 6 to 8 lb. of sulphur are usually used per ton of fruit, and sulphuring should be continued for a period of 2 to 6 hours, depending upon the type of fruit being treated and upon its condition. At the end of the period, both inlet and outlet vents should be closed and the sulphur extinguished. This method is in common use, but it will be seen that there is difficulty in regulating the amount of sulphur absorbed. Within recent years a continuous process of sulphuring, by passing the fruit through a tunnel, has been evolved, and the amount of sulphur dioxide can be controlled by varying the speed at which the fruit travels through. In some factories the burning of sulphur as a means of providing sulphur dioxide is being displaced by the introduction of gauged amounts of sulphur dioxide gas from cylinders, but even with these possible improvements the variation in the absorptive properties of the fruit itself is always very apparent. The amount of sulphuring should be reduced to a minimum, since with certain fruits it is difficult to reduce the amount to come within the limits during the drying process. Fruits such as apples, pears, etc., which have been cut during preparation, will naturally absorb sulphur dioxide more quickly than fruits such as prunes or sultanas, of which the skin remains intact. Similarly, the former will tend to lose more sulphur dioxide during the drying process than the latter. All these factors have to be taken into account.

A certain amount of sulphur dioxide is removed during the drying process, and a further quantity is lost during storage, but most manufacturers consider that satisfactory sulphuring is being obtained if the amount remaining after drying is somewhat less than the permitted amounts.

Drying

The first departure from the old sun-drying process was to dry fruits on kilns similar to malt kilns. This process, although quicker than sun drying, caused considerable darkening of the fruit, and a definite flavour was imparted to it. This method has now been almost entirely superseded by the air blast dehydrater, which is a continuous process involving very little labour. In some cases vacuum dryers have been used with success, particularly with such fruits as apples and pears, which oxidise so very readily. An air blast dryer is practicable for most fruits, and its success depends upon the regulation of the humidity of the air passing into the plant and emerging from it. When relatively dry air is passed over the fruit at a temperature of 150° to 170° F. it becomes loaded with water vapour obtained from the fruit, which thus becomes dry. If cold dry air were continually drawn over fruit at this temperature the rate of drying would be so rapid that case-hardening would occur, with the result that the inside portion of the fruit would not dry out properly. Therefore, to avoid this, some of the moisture-laden air, which is passed over the fruit and issues from the end of the dryer, is by-passed to the inlet in order to maintain the air at about 60 per cent. relative humidity. By proper regulation of the by-passing arrangement the fruit is dried out gradually and evenly in about 6 hours.

(*Continued on page* 451.)

DAIRY FARMING in INDIA

By N. G. Chatterji, D.Sc., D.I.C., A.M.I.Chem.E.

THE QUESTION of acute unemployment amongst educated Indians has been engaging the serious attention of the Government. In this connection a powerful body of public opinion is advocating the principle of "back to land". They believe that dairying, fruit and vegetable growing should be profitable lines for educated young men to enter, though many of those that have actually been engaged in it hold quite a different opinion, at least so far as dairy farming is concerned. A lucid survey of the dairy farming industry as it exists at present in India has been recently given by the Principal of the Agriculture Institute, Allahabad, in which he mentions some of its peculiar features, the like of which is not to be found, perhaps, in any part of the civilised world.

Lack of Legislation

One of the greatest impediments to the progress of this industry in India is the wholly inadequate legislation to prevent the adulteration of milk and its products. In the big cities it is impossible to get regular supplies of dairy produce that are of good quality and at the same time delivered in a sanitary condition. Bad milk and *ghee* (melted butter fat) have steadily driven out the good, with the result that few are willing to pay the price for good dairy products. The prevailing custom in Indian cities of having the *gowalas* (milkmen) bring in their cows and buffaloes as long as they are in milk, and then dispose of them to the butcher when they go dry, has been one of the most serious causes for the rapid deterioration of the best milk breeds of India. The city *gowalas* have insufficient grazing, so that the cattle are kept penned up, often in unsightly and insanitary surroundings. It is much more expensive to feed cattle in the city, though feed is one of the main items determining the cost of milk. As many of the *gowalas* live in cities, their cattle have very little grazing except occasional free feeds on private lawns when gates have remained inadvertently open, albeit to the loss and annoyance of the house owner. There is therefore little hope for the dairy industry until the cattle are moved out of the cities to more suitable places and the *gowala* made to carry on his trade both under sanitary conditions and by honest means deriving his profits from the milk of his cows and not, as at present, from the water which he adds to it.

Agricultural Research

Within the last ten years or so some Agricultural Institutes have paid a great deal of attention to the improvement of dairy cattle so as to provide cheap and abundant wholesome milk for the people. In almost every case there has been a sad and expensive experience, at least during the initial stages. There is no purely Indian breed of dairy cows to-day of which even a quarter of the best would average 250 gal. of milk per year. Unless a cow does this, under modern Indian city conditions she will involve her owner in an annual loss, which is the case with probably 90 per cent. of cow owners. No doubt, given time and skilled scientific breeders, Indian breeds can be developed as have been done in other countries, but it would take some fifty years or so to get any tangible result. But even more difficult than the length of time would be the attitude of certain groups of Indians, who fail to realise that the cow problem of India is an economic and not a religious one.

The only economic and profitable way of producing an abundant supply of pure milk is to import bulls of modern American and European dairy breeds and use them in connection with one of the well-known Indian breeds of cows—an example of true international partnership and co-operation. The Indian cow would provide three essential factors to partnership—namely, ability to stand the climate, high digestive efficiency, and immunity and resistance to disease—while high milk-producing capacity and early maturity would be the contribution of the foreign bull. Cross-bred cows obtained in this way have in almost every case been found to be profit-makers for their owners.

Such is the condition of the industry in India, where a very large section of the population is vegetarian and milk and milk products form one of the most important items of daily diet. Curiously enough, the consumption of butter as such is quite small, though *ghee* is probably the only fat which is universally used for cooking and edible purposes. In addition to milk and *ghee*, Indians are very fond of casein, which forms one of the chief ingredients in the preparation of most of the more expensive condiments and delicacies. There is therefore considerable demand for milk in the city from these condiment makers also. This demand is chiefly met by supplies drawn from neighbouring villages, and every morning one may see a long line of villagers hurrying to town with their load of milk on their head or suspended from either side of a bamboo stick carried on shoulder.

As has already been said, adulteration of milk and milk products is now so widely practised in India that the public has come to believe that pure milk, butter, and *ghee* have become extinct in this country. Low yield and

(*Continued on page* 451.)

CHEMICAL ENGINEERING CONGRESS

A further review of papers and discussions of particular interest to food manufacturers, contributed from many countries of the world at the recent Chemical Engineering Congress.

TREATMENT & DISPOSAL of EFFLUENTS & WASTE MATERIALS

By A. Parker, D.Sc., F.I.C.

THE IMPORTANCE to the community of devising and applying practicable methods of reducing the pollution of rivers and streams and other sources of water supply is now generally recognised. Unless satisfactory methods of treatment and disposal of sewage and industrial wastes are adopted to a much greater extent than at present there will undoubtedly be increasing difficulty in the future in providing the very large quantities of water of good quality required for domestic, agricultural, industrial and recreational purposes.

Dr. A. Parker.

Industrial undertakings responsible for the preparation and manufacture of foods of various kinds are particularly interested from several points of view in the subjects discussed in Sub-Section A of Section F. In the first place, they often require plentiful supplies of water of good chemical and bacteriological quality to ensure satisfactory products for the market. If the waters most easily accessible to the factories are polluted by sewage or industrial effluents, considerable expense may have to be incurred in the purification of the polluted water before use or in obtaining suitable supplies from a distant source. Secondly, many factories, such as those concerned with the milk industry, the manufacture of jam, the manufacture of beet sugar, and the canning of fruit and vegetables, are confronted with problems of treatment and disposal of large volumes of highly polluting waste waters. In certain branches of the food industry difficulties also occur owing to the production of vapours of objectionable odour which may cause a nuisance.

Factory Pollution Equivalents

Manufacturers do not always realise to what extent the waste liquids from their factories are polluting in character. To illustrate the harmful effects of some of the liquid effluents from the food industry, it may be mentioned that the waste waters from a beet sugar factory of average size are equivalent in polluting action on a river to the domestic sewage from a town with a population of about 300,000 people. Washings from a milk collecting and distributing depôt handling 10,000 gal. of milk per day have about the same effect as sewage from a population of 1,000. Waste waters from a factory using 10,000 gal. of milk per day for the manufacture of butter and cheese are equivalent to the domestic sewage from 2,000 to 3,000 people, even with careful control to reduce to the minimum the quantity of polluting matter discharged with the wastes; this estimate assumes that buttermilk and whey are not treated as waste materials but are utilised for feeding pigs or for the production of dried products for the manufacture of food for cattle and poultry. Other similar examples could be given.

Legal Aspects

Of the four papers presented for consideration at the Congress, the two by Mr. W. L. Stevenson and by Dr. H. T. Calvert included useful reviews of the general, legal and technical aspects of problems of water pollution in America and Great Britain respectively. With regard to the legal position, Dr. Calvert referred to the Rivers Pollution Prevention Act, 1876, the Local Government Act, 1888, and the Salmon and Freshwater Fisheries Act, 1923. In summarising his paper, he expressed the opinion that so far as Great Britain is concerned there is ample legislation directed against the pollution of rivers. For various reasons, however, the law has not always been enforced and many rivers flowing through thickly popu-

lated industrial areas are even to-day in a badly polluted condition. One reason is that means of preventing pollution without undue cost to industry are in some cases unknown. In 1927, after the establishment of the beet sugar industry in Great Britain had led to the gross contamination of streams previously relatively unpolluted, the Government set up, under the Ministries of Health and of Agriculture and Fisheries, a Joint Advisory Committee on River Pollution. At the same time the Water Pollution Research Board of the Department of Scientific and Industrial Research was appointed. In its second report, the Joint Advisory Committee recommended that, subject to certain conditions, the local Sanitary Authorities should be under a general obligation to receive and dispose of the industrial effluents of their districts and that the traders should have a correlative right to discharge such effluents into the public sewers. This recommendation, which was based on the fact that in many instances trade effluents can be dealt with most satisfactorily in admixture with sewage at the local sewage disposal works, is the basis of the Public Health (Drainage of Trade Premises) Bill recently introduced into the House of Lords.

Practical Methods

On the technical side, Mr. Stevenson and Dr. Calvert outlined the principles to be followed in devising practicable methods of treatment and disposal of industrial waste waters. To illustrate these principles and to draw attention to the results of recent investigations, Mr. Stevenson's paper contains an Appendix in which are described processes for the treatment of certain industrial effluents; these include waste waters from the milk industry, grain distilleries, vegetable canning and from the manufacture of products from American maize. Dr. Calvert gave examples from the work of the Royal Commission on Sewage Disposal (1898 to 1915) and from the more recent investigations by the Water Pollution Research Board.

Both papers show that in the past it has frequently been assumed that the production of polluting waste waters is unavoidable, and that the problems can only be solved by devising methods of purification of the wastes before discharge. As a result of investigation, however, there are cases in which the discharge of industrial waste waters has been avoided by modifications in manufacturing processes, or by simple treatment of the wastes so that they can be re-used in the factory. For example, the work of the Water Pollution Research Board has shown that the waste waters from a beet sugar factory require only simple treatment by sedimentation and occasional addition of small quantities of lime to render them suitable for re-use in the processes. Professor E. Barlow (State University of Iowa), in contributing to the discussion, gave another example. He mentioned that at one starch factory, re-use of large volumes of the waters had reduced the quantity of polluting matter discharged to only about 5 per cent. of that previously allowed to flow into the river. At another factory the small proportion of waste not re-used was concentrated and sold as cattle food.

Further Investigation is Required

Further intensive studies of manufacturing processes are urgently required, however, with the objects of avoiding the production of polluting effluents, of recovering by-products of value, or of reducing in quantity and polluting character any effluent necessarily produced. When everything possible in this direction has been accomplished, it is often in the mutual interest of the rivers and the manufacturers that the unavoidable effluents, sometimes after preliminary treatment, should be admitted under controlled conditions to the public sewers for treatment along with the domestic sewage of the district. In instances in which admission to the sewers is not practicable, existing knowledge of methods of purification of domestic sewage frequently serves as a basis in devising processes for the treatment of the industrial effluents before discharge to streams. For example, an investigation now being carried out by the Water Pollution Research Board in co-operation with the milk industry has already shown that milk washings can be efficiently purified by biological oxidation in percolating filters or by the activated sludge process, operated under the right conditions.

A paper by Mr. K. E. Jensen (Denmark) gave an interesting account of a process in operation at Slagelse for the purification of the highly polluting waste waters from the manufacture of yeast from molasses. The method adopted comprises anaerobic fermentation, sedimentation in ponds and final treatment by biological oxidation in percolating filters.

The fourth paper considered in Sub-Section A of Section F was presented by Mr. W. A. Damon and Dr. B. Wylam. It is a survey of the legal and technical aspects of the problems of disposal of gaseous effluents, so far as Great Britain is concerned. Methods of treatment of industrial waste gases are described, whereby the noxious or foul constituents may be recovered or destroyed, and the toxicities of many of the gases are tabulated. The section of the paper of particular interest to the food industry is that dealing with the prevention of nuisance by foul gases from the treatment of animal and fish offal. It outlines the precautions to be observed with the object of reducing the quantity of foul gases to the minimum and briefly describes deodorisation by incineration and by chlorination. A useful bibliography at the end of the paper mentions D. Ronald's recently published *Handbook of Offensive Trades*.

The papers dealt with by the author are the following:

SECTION F., SUB-SECTION B.—*F 7. The Treatment and Disposal of Industrial Wastes (United States). By W. L. Stevenson.*

F 3. The Disposal of Industrial Effluents (Gt. Britain). By H. T. Calvert.

F 2. Purification of Waste Water from Yeast Factories (Denmark). By K. E. Jensen.

F 4. The Disposal of Gaseous Effluents (Gt. Britain). By W. A. Damon and B. Wylam.

BIOLOGICAL PROCESSES

By W. Preston, M.Sc., Ph.D.

Fumigation and Fumigation Practice

The destruction of insects and their larvæ is a matter of considerable importance to all those engaged in the food industry, and the paper by Professor J. W. Munro dealing with recent advances in Fumigation and the Needs of Fumigation Practice is of special interest. Although fumigation has been practised for a very long time, it has, on the whole, been used empirically, and only during recent years has the problem been investigated with a view to determining basic principles. It is essential not only to understand the factors controlling the actual poisoning of the insects, but also those dealing with the fumigant which is left in the goods after the process has been carried out.

Dr. W. Preston.

Experimental work has shown that insects will succumb more readily to toxic vapours when kept at a higher temperature than the normal either before or during fumigation. This suggests that when the rate of growth of the insect is greater, fumigation is easier, and conversely, it is most difficult to kill a hibernating insect at a low temperature. Insects breathe through small openings, known as "spiracles", and when these are closed, no diffusion of gas into the insect can take place, and hence under these circumstances the latter cannot be poisoned. If, however, the insect can be persuaded to open these "spiracles" to a greater extent, the rate of toxicity will increase. This can be done by means of gases such as carbon dioxide, known as "auxiliary fumigants". A parallel case with human beings is the administration of oxygen mixed with carbon dioxide to promote more effective breathing.

The author of the paper has expressed an opinion, however, that the above theory is open to doubt, and that it is of little value to recommend the extended use of auxiliary fumigants. Vacuum fumigation, too, is open to criticism, as the effects of reduced pressure on insects are far less important than in the case of mammals.

It is essential after fumigation to disperse the residual gas. The amount of this depends on several factors. Amongst these may be mentioned the degree of penetration of the goods by the fumigant, and the extent to which it is absorbed by the goods and on the walls of the chamber; and especially the rate at which the absorbed fumigant is given off again on ventilation. It is far more difficult to secure uniform distribution of a fumigant, even in a small vessel, than would be imagined, and special precautions must be taken to ensure that dispersion has taken place. The packing and piling of goods within the fumigator has a large effect in this connection, and this point alone offers a wide field for experimental work. The removal of residual fumigant (certainly in the case of food products) is almost as important a problem as increasing the toxicity of the fumigant itself, even the type of packings used for the goods being treated must be considered. As an example of this, it has been found that the wooden packing cases used in the dried fruit trade are capable of absorbing a surprisingly large quantity of fumigant.

In the discussion which followed, Mr. E. A. Alliott (Messrs. Manlove, Alliott & Co.) expressed the view that with vacuum fumigation, improved penetration of the goods was secured, and also that an increase of temperature during fumigation was of great assistance. He referred to the successful use of ethylene oxide for apple scale, and agreed that a large amount of research into the basic principles of fumigation had yet to be carried out.

It would have been of interest to report here the remarks of Dr. A. B. P. Page, of the Imperial College Biological Research Station, Slough, in full, but space will only allow a few of his helpful comments to be included. Dr. Page emphasised the need for a fuller knowledge of insects and their reaction to fumigants, and advocated the use of higher doses than are normally given, as insects of the same genus and species offer widely differing resistance to the poison used. He was of the opinion that although the use of vacuum improved toxicity, it did not increase the degree of penetration of the fumigant. The packing and piling of the goods, and the circulation and even distribution of the fumigant, were matters which demanded very close attention. It was also desirable, he said, to consider the material of which the fumigation chambers were made, this to be selected so that the amount of absorption on the walls would be a minimum. Iron vessels were not always satisfactory. In addition, fumigating plants should be subjected to routine tests.

In conclusion, it may be noted that the author has emphasised that there is still great need for research on fundamental principles, but at the same time he has given a very clear account of present-day knowledge in a form which can be appreciated not only by the chemical engineer, but by those interested in the practical application of fumigation.

Frozen Food Industry in Japan

Takeshi Murayama, in his paper on the progress of this industry in Japan, stated that refrigeration processes in that country have been developed almost entirely in con-

junction with the fishing industry. In 1933, Japan furnished approximately 25 per cent. of the world's catch, by far the greatest quantity handled by any one country. Only about half of this (about two million metric tons) could be used as food, the remainder being utilised as fertiliser.

As the catches of fish are extremely irregular, any process which can be used to regularise supplies is worthy of note. Preservation enables fish of uniform quality and price to be available irrespective of the season, and the author has tabulated the advantages of a preservation system at some length. In discussing the advantages of cleaning fish on the actual fishing grounds, it is suggested that this would prevent nuisances in the towns due to fish offal. It is to be wondered to what extent this argument can be applied, and if the whole of the Japanese fishing ports are akin to a fish market.

The Japanese frozen fish industry was placed on its feet in 1918, and in 1934 the total production was 45,000 tons. The freezing is carried out in the majority of cases by direct contact of the fish with chilled brine, although the slower air freezing process is still in use, this being more suitable for the treatment of whole fish.

Fish can be preserved so that when thawed out after freezing they are in the same condition as when caught. To ensure this state of affairs, rapid freezing immediately after catching is necessary, and to do this, it is most convenient to have freezing plant of special design on the actual trawlers, a number having been built for this purpose. In addition there are freezing factories at several of the fishing ports, where the fish is packed into small cartons for the market.

In addition to fish, research is also being carried out on the freezing of eggs, poultry, vegetables and fruit. Strawberries, melons and tropical fruit such as mangoes have been successfully frozen, and active work is being undertaken in many directions, the whole industry having received a subsidy from the Japanese Government since 1923.

It is recorded that the industry suffered in its early stages from lack of capital, but in reading this paper it might well be imagined to be the report of a particularly successful company. There is, one feels, a touch of great pride in announcing that in 1934 the output of frozen peas rose from 7·5 tons to 37·5 tons, and one might almost imagine the Chairman of the Board emphasising the "thirty" in giving these figures. To what extent they are of use it is difficult to say. At least they are an indication of the competition which may be expected from Japan, and perhaps from this point of view alone the paper is of interest.

Fermentation Processes

It has been estimated by W. Vogelbusch, author of the paper on the design of apparatus and heat economy in the fermentation industry, that the average annual yeast consumption per head of the population is something like 1½ lb. To an Englishman, matters of bread and beer (cheese cannot unfortunately be included) are of paramount importance, and both require yeast for their preparation.

Yeast is prepared by "seeding" with a pure culture, or "mother" yeast, any suitable nutrient solution in which the cells can develop. Beet sugar molasses are used extensively on the Continent, whereas in England cane sugar molasses, barley, potatoes and so forth are employed. During the development of the yeast in the liquors made from these varied sources, it is essential to keep it aerated, and the author has described a neat device by means of which air can be dispersed through the wort in fine bubbles, together with a considerable saving of power. The production of alcohol is carried out on similar lines to that of yeast, and, as the world's alcohol consumption is increasing, owing to its use as a motor fuel, more attention is being paid to the construction of distillery plant.

The by-products of both the yeast and alcohol industries are worthy of attention. Not only are they extremely unpleasant if discharged from the works in the crude state, but various useful salts can be obtained by working up these residues. From yeast factories the effluent may be concentrated by evaporation and calcined, the ash providing potash and similar salts. The residue from alcohol fermentation processes using cereals and potatoes can be used as cattle food, whereas that from molasses, not being suitable for food on account of its high potash content, is capable of conversion to fertiliser, in addition to being a source of various useful salts. The yeast and alcohol industry is thus entitled to the attention of all those engaged in the food industry, not only for the great variety of foodstuffs which can be used as raw material, but also for the numerous and widely differing products prepared concurrently.

The papers dealt with by the author are the following:

SECTION L., GROUP III.—*Biological Processes. L3. Recent Advances in Fumigation and the Needs of Fumigation Practice (Gt. Britain). By Professor J. W. Munro.*

L6. The Progress of the Frozen Food Industry in Japan (Japan). By Takeshi Murayama.

L1. Some Observations on the Design of Apparatus and Heat Economy in the Fermentation Industry (Austria). By W. Vogelbusch.

ELECTRICAL PASTEURISATION OF MILK

By H. J. T. Ellingham, Ph.D., A.R.C.S., A.I.C.

In a paper presented at the recent Chemical Engineering Congress in London, Professor A. H. W. Aten, of Holland, describes an apparatus for the pasteurisation of liquids, especially milk, by electric heating. The milk is passed through a cylindrical vessel built up of short cylinders of glass separated by perforated graphite plates which are connected in accordance with a simple scheme to the terminals of a three-phase alternating current supply. The electric current enters through these graphite electrodes and generates heat in its passage through the

milk. By regulating the flow of the milk through the apparatus the temperature at which it leaves the pasteuriser can be controlled. Photographs of the apparatus and a diagram of the electrical connections are given in the paper.

Tests carried out on a commercial-scale apparatus used by the Vereenigde Amsterdamsche Melkinrichtingen indicate that a temperature of 70° C. (160° F.) suffices to destroy *B. coli* and *B. tuberculosis* within 30 seconds and to reduce the total number of bacteria to 1 per cent. of the original value. The keeping quality of the milk is correspondingly good, while it retains the taste and other properties of raw milk. About 3 gal. of milk can be treated per unit of electricity (kilowatt-hour), or about twice this amount if the apparatus is provided with a heat-exchanger.

The following paper is dealt with by the author:

SECTION D, SUB-SECTION B.—*D 6. Electrical Pasteurisation of Liquids (Holland). By A. H. W. Aten.*

DAIRY FARMING IN INDIA

(*Continued from page* 446.)

poor quality of the milk obtained from his cows almost forces the dairyman to resort to adulteration so as to make both ends meet. No doubt there is legislation against adulteration, but as matters stand at present it has failed to serve its purpose. The principal defect lies in the application of the law. The defaulters get off either scot-free or with a small fine, which has no deterrent effect. To remedy these defects and to place dairy farming on sound and healthy lines, proposals have been made from responsible quarters to induce Government to make more stringent legislation against adulteration, and to have some sort of veterinary supervision over dairy cattle as a measure against the spread of tuberculosis, which is eating into the very heart of India.

FOOD COLOURS PERMITTED IN NEW ZEALAND

SINCE the publication of an article on Food Colours, by Harold Silman, B.Sc., A.I.C., in the June, 1936, issue, the following additional information has come to hand:

Under an Amendment dated December 12, 1933, to the Sale of Food and Drugs Act (1908) these colours previously not on the list of colours permissible in foodstuffs are now allowed:

Red.—Bordeaux B.
Rhodamine B.
Ponceau 2 R.
Green.—Guineau Green B.
Fast Green F C F.
Blue.—Soluble Blue.

DRIED FRUITS

(*Continued from page* 445.)

In practice, although it is the relative humidity of the ingoing air which is important, a check is usually made on the outgoing air; by regulating this to a certain degree, depending on the type and condition of fruit, constant drying conditions can be maintained. The relative humidity of the outgoing air may vary from about 18 to 20 per cent. (at 165° F.) in the case of apples, to as much as 40 per cent. (at 165° F.) for pears. The temperature at which evaporation is made is also important and should be kept below 170° F.

Keeping Properties

Although dried fruits may be sent out from the factory with the correct amount of moisture (say 10 to 20 per cent.) and may keep indefinitely with normal storage, under certain conditions they may deteriorate rapidly. The percentage of moisture in dried fruits may increase or decrease, according to the relative humidity of the air in which they are stored. For example, at 80 per cent. humidity dried fruits will absorb moisture, and if stored for any length of time under such damp conditions the amount may increase to beyond a safety point. This is usually considered to be about 22 to 24 per cent. moisture. At this stage the moisture is sufficient to support a growth of yeasts, moulds, and bacteria, and trouble from fermentation or moulding may occur. Of prime importance, therefore, is the type of storage to which dried fruits should be subject, and here again the similarity to jams and jellies is very apparent. Correctly made jams, jellies and dried fruits will, by virtue of their power to absorb moisture from the air, deteriorate when stored under damp conditions.

In addition to spoilage from micro-organisms, dried fruits are sometimes subject to attacks from insects, such as moths and beetles. Once this type of spoilage gains access to the warehouse it is very difficult to suppress it, and some form of sterilisation is the only cure. Either the fruit should be heat sterilised for several hours at 140° to 150° F., or the warehouse should be fumigated with some chemical antiseptic, such as carbon disulphide or prussic acid. The former is the more costly method, but is the safest, and if correctly carried out should kill all eggs and grubs. In most cases such infections are caused through allowing dirty storage conditions to prevail, and the best way of guarding against it is to have no fruit exposed and the warehouse well ventilated. Fruits which have been sulphured have been said to be less prone to insect pests than unsulphured fruit, but under bad storage conditions sulphur will not ensure freedom from attack. Some packers go to the trouble of sterilising the fruit as a regular practice. If this is done there could obviously be no liability to infection, except from outside sources. If packing is done in insect-proof containers, such as tins, or partially insect-proof packages, such as waxed paper cartons, losses from this cause are inconsiderable.

INFORMATION and ADVICE

Honey Jelly, Honey Butter and Honey Cream—Sterilising of Pickles—Latent and Specific Heats—Piping Jelly—Cream Filling—Pickled Cabbage

Honey Jelly, Honey Butter and Honey Cream

2,061. *Would you please furnish me with information on the manufacture of honey jelly, honey cream, and honey butter?* (Australia.)

Typical recipes are as follows:

HONEY CREAM

White sugar	20 lb.
Glucose (40)	7¾ lb.
Tartaric acid	2 oz.
Water	1¾ gal.
Honey	10 lb.
Cornflour	2½ lb.
Cream or unsweetened condensed milk	10 lb.

Mix the cornflour with part of the water to a thin paste. Place balance of the water in a steam pan. Add remainder of the ingredients and bring to the boil, stirring well all the time. Add the cornflour, stir well, and slowly bring to the boil. Simmer gently for 5 minutes. It is essential that the glasses are clean and dry. The cream should be filled hot at not less than 190° F.

HONEY BUTTER

White sugar	20 lb.
Glucose (40)	10 lb.
Tartaric acid	2 oz.
Water	2 gal.
Honey	10 lb.
Butter	10 lb.
Cornflour	2½ lb.
A little yellow colour.	

Mix the cornflour with part of the water to a thin paste. Place balance of the water into a steam pan and add all the other materials (not the cornflour), and bring to the boil, stirring all the time. Now add the cornflour, stir well in, and add a little yellow colour, and simmer gently for 3 minutes. Fill hot at not less than 190° F. See that all the glasses are clean and dry.

HONEY JELLY

(*a*)	Agar-agar	2½ lb. (soak for 24 hours)
	Water	10 gal.
(*b*)	White sugar	200 lb.
	Water	6½ gal.

Place (*b*) in a steam pan, stir up well and bring to the boil, and boil to 240° F. Shut off the steam and add (*a*) to (*b*). Stir well up and add 60 lb. of glucose (40), stir well and then add 60 lb. of honey. Turn on steam and bring to the boil, and gently boil to 220° F. Stir well and pass through a fine hair sieve. Return to pan and fill hot at not less than 180° F. See all the glasses are clean and dry.

Sterilising of Pickles

2,062. *Can you please tell us if it is customary to sterilise pickles before or after packing in jars?* (Birmingham.)

It is usual to sterilise pickles, and one of the main points is that the bottles must be capped.

After the capping process place in a cold water bath and gently raise the temperature to 160° F. in one hour and then to 180° in another hour; this applies to 10-oz. bottles. For 20-oz. bottles bring to 160° in one hour and then to 180° in another 1½ hours.

Latent and Specific Heats

2,063. *We wish to know the latent heat of solidification and the specific heat before and after fusion of toffee. We should be glad if you could help us.* (London.)

We have not been able to trace any actual figures, but there is no reason, however, why these constants should not be calculated given a knowledge of the composition of the sample.

The latent heat of solidification of edible fats varies considerably, as would be expected from the fact that more or less of the component glycerides remain liquid at normal temperatures.

The limits can be taken as 18 to 54 B.t.u. per lb. of fat. It must be borne in mind that this latent heat will not begin to come into effect above the melting point of the fat (76° to 92° F.) and, as crystallisation is gradual, might not become effective at all over the period of cooling which you might be considering.

The fat is the only component of toffee which changes state during cooling; the other components existing as a super-cooled solution. The latent heat of the sample can therefore be calculated from the proportion of fat.

As regards the specific heat the following values for the various components can be used:

Non-fatty solids	0·30 B.t.u./lb. ° F.
Fat	0·50 ,, ,,
Water	1·00 ,, ,,

The specific heat of the sample can be calculated, taking into account the composition. It will be substantially the same before and after solidification.

As an example, take a toffee of the following composition:

Non-fatty solids	77 per cent.
Fat	15 ,, ,,
Water	8 ,, ,,

Latent heat will be from—

$$\frac{15}{100} \times 18 = 2{\cdot}7 \text{ B.t.u./lb. to} —$$

$$\frac{15}{100} \times 54 = 8{\cdot}1 \quad ,, \quad ,,$$

Specific heat will be—

$$\left(\frac{77}{100} \times 0{\cdot}30\right) + \left(\frac{15}{100} \times 0{\cdot}50\right) + \left(\frac{8}{100} \times 1{\cdot}0\right)$$

$$= 0{\cdot}231 + 0{\cdot}075 + 0{\cdot}080$$
$$= 0{\cdot}386$$

Piping Jelly

2,064. *We shall be glad if you will give us particulars of the use of gum tragacanth in the manufacture of soft piping jelly, and also state whether whole or powdered gum should be used. What can be done to prevent mould forming on the top of piping jelly after it has been packed in tins?* (England.)

A typical formula is as follows:

Gum tragacanth	2 lb.
Water	4 gal.
Glucose (40)	40 lb.
Tartaric acid in 1 oz. of hot water ..	½ oz.
Essence	4 ,, (approx.)

Colour to taste.

Soak the gum in 2 gal. of the water for 24 hours. Stir up well and add the other 2 gal. of water and allow to stand for another 24 hours. Dissolve the acid in the ounce of hot water. Rub the gum through a fine hair sieve into a steam pan. Place the glucose in another steam pan and gently bring to about 180° F. and shut off the steam. The gum is next brought to the boil, and should be stirred all the time. Add the hot glucose, stir well, and bring to about 218° F. Rub all through a fine hair sieve. Add the flavouring, allow to cool, fill and place a paper disc that has been dipped in glycerine on the top of each tin. A pint of glycerine can be added to piping jelly when boiling, which will assist in preventing mould growth.

We understand that whole gum is best, and the medium quality makes quite a good product, although naturally the best quality produces a better product.

Cream Filling

2,065. *We are making a cream filling from the following recipe, but this is not giving satisfaction, and we should be glad if you could advise us where we are wrong, or failing this, supply us with an alternative recipe which would prove satisfactory. We first make a meringue by boiling together 24 lb. of glucose with 16 lb. of sugar to 225°, which is beaten in the machine with 21 lb. of liquid albumen (5 to 1 solution). We cream 28 lb. of unsalted margarine and, after the meringue is cold, this is added to the creamed margarine and mixed in the machine lightly with 4 lb. of dried milk and vanilla flavouring.* (Manchester.)

It is a little difficult to answer the query raised with regard to cream filling since it is not stated for what the cream is required and also the reason why the present recipe is unsatisfactory is not given.

We would imagine that the trouble probably lies in the inability of the cream to stand firm, and this is probably on account of the fact that there is too much water in the cream.

In order for a cream of this description to keep satisfactorily, the amount of water should not be more than about 10 to 12 per cent., whereas the total of the water present in the recipe would be about 28 per cent. Better results would be obtained if the albumen were used in a more concentrated form, and, in addition, the sugar syrup should be boiled to 235° to 240° F.

Pickled Cabbage

2,066. *Will you please let us have information on the manufacture of pickled cabbage?* (Devonshire.)

The cabbage is first salted. This may be done either by dry salting or by brining. The former gives a better quality, but the latter is a shorter process.

In dry salting the cabbage, after being cut up, is spread out on tables and then well mixed with the salt. Allow to stand overnight, and then subject to gentle pressure in a press, after which it is vinegar pickled. The process is as follows:

In brining, place 4 cwt. of cut cabbage in a cask, add 28 lb. of dairy salt and fill up with water. Next day drain off the brine completely and fill up with acetic acid as follows:

Fill up the cask with dilute acetic acid (3¾ gal. of 80 per cent. acetic acid in 46 gal. of water) or pale malt vinegar of 24 gr. Never use vinegar that has been coloured. The cask should now contain 22 gal. of vinegar to the shreds derived from 4 cwt. of cabbage. If the proportion of vinegar is too low the cabbage will be soft and limp, whereas if it is too high the cabbage will be too sour.

Close the cask and stand in a cool place, with a temperature never above 80° F., for 10 to 14 days before using. The cask is only lightly bunged so as to allow the gas arising from fermentation to escape. It is important to avoid contact with iron or alkalies, otherwise the colour of the pickled cabbage will be impaired.

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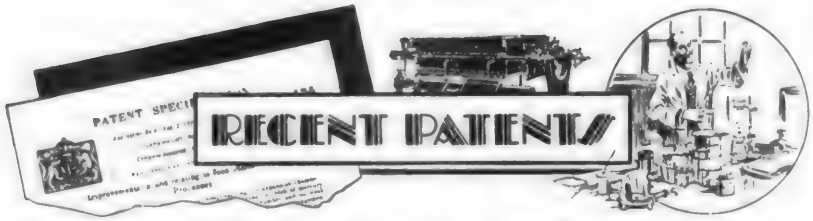
Enquiry 2059, November issue

We would draw the attention of our readers to the reply to the above enquiry which states that 10-20 per cent. of rusk could be employed in the manufacture of pastes. This amount was unfortunately given in error and the amount of rusk present should not exceed 10 per cent., otherwise Public Health authorities would be likely to take action.



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Latest Patent Applications

26819. PRESERVATORS, LTD., RYNER, A.: Protection of vegetables, etc., during storage. October 2.

26986. I.G. FARBENINDUSTRIE AKT.-GES.: Manufacture of liver, etc., extracts. October 5.

26997. HOVEMAN, J. C.: Preservation, etc., of foodstuffs. October 5. (Germany, October 4, 1935.)

27168. COLLINSON, E. W., and WALTON, F. W.: Manufacture of chocolate, etc. October 7.

27224. WHEATLY, P.: Process for manufacture of soya flour. October 7.

27459. HOMMEL, G. W.: Process for preserving food. October 9.

27460. MAIN, J. A.: Manufacture of tea. October 9.

27909. FEURTADO, L. C. A.: Production of sugar, etc. October 14.

27948. CITERRI, R., GALOTTI, M., and POLACCI, G.: Process for preservation of vegetable products. October 14. (Italy, October 15, 1935.)

28716. LEWKOWITSCH, P. R. E., MOLTCHANOVA, H.: Treatment of fats, etc. October 22.

29028. ELLIS, F. A.: Manufacture of ice-cream. October 26.

29139. BARON, R.: Food preparations. October 27.

29149. WEMYSS, J. G.: Method of packing, etc., tea. October 27.

29342. WEIZMANN, C.: Foodstuffs. October 28.

Complete Specifications Accepted

454,421. IMPERIAL CHEMICAL INDUSTRIES, LTD.: Preparation of baked cereal foodstuffs.

454,500. BAADER, R.: Methods of and apparatus for dressing fish.

454,504. CALIFORNIA FRUIT GROWERS' EXCHANGE: Method of treating pectin.

454,513. DU PONT DE NEMOURS AND CO., E. I.: Preparation of bread and other baked cereal foodstuffs.

454,528. NYROP, A.: Process and apparatus for continuous extraction of vitamines and products containing vitamines.

454,566. PROCTER AND GAMBLE CO.: Manufacture of sweet baked goods.

454,591. BEECH'S CHOCOLATES, LTD., and COLLINSON, E. W.: Sweetmeats.

454,610. BØGGILD, C. B. K., JACOBSEN, M., and AASTED, K. C. S.: Treatment of chocolate or other semi-liquid or plastic substances.

454,685. HOBART MANUFACTURING CO.: Mills for grinding substances such as coffee beans. (August 13, 1934.)

454,705. INTERNATIONAL LATEX PROCESSES, LTD.: Rubber bag for protecting foodstuffs.

455,062. NATIONAL SUGAR REFINING CO. OF NEW JERSEY: Manufacture of non-caking granular sugar.

455,172. DENFORD, H.: Method of treating wrappers for the preservation of chilled and frozen carcasses.

455,180. MANTELET AND BOUCHER: Mills for pepper, salt, sugar, coffee, and the like. (December 15, 1934.) (Cognate application 34244/35.)

455,221. AKTIESELSKABET DANSK GAERINGS-INDUSTRI: Process of improving the baking strength of flour.

455,456. ANDERSSON, A.: Process and apparatus for the purification of cream.

455,465. UNITED WATER SOFTENERS, LTD.: Process and apparatus for the production of carbonated beverages.

455,490. JØRGENSEN, A. M.: Process and apparatus for disinfection of bottle stoppers.

455,545. SCANDOLA, G., and CONSERVENFABRIK ST. GALLEN AKT.-GES.: Lid fastening for preserve tins.

455,616. PRESTAGE, E.: Milk pasteurising and cooling units.

455,691. WEISSENBERG, H.: Process of producing butter and cheese from animal milk.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

453,417. **Sweetmeat manufacture.** R. W. ROBINSON and A. OLSEN, JUNR., 1975, Market Street, San Francisco, California, U.S.A.

A normal smooth candy, comprising, for example, milk, corn syrup (glucose), sugar, fat, and flavouring, or a fondant or bon-bon cream (without the milk and fat), is prepared in the normal manner, cooling and creaming the mass at suitable temperatures to obtain a product of fine, smooth texture. It has now been found that if this product is dried and ground the powder obtained is stable, and on gentle heating with water will thereafter set to give a candy, etc., as smooth as the original product, without any special creaming process. The powdered product is thus very suitable for sale as a material for the simple preparation of candy in the home. The drying process may be performed by chopping up the set candy and drying it in a current of air, or by further heating the product before setting and then passing it through rollers and cutters. For the marketing of fudge powder, the product keeps better if the fat and flavouring are omitted; these can be added later (butter and flavouring) by the home user, for example, by heating 4 ozs. of powder, 1 tablespoonful of water, 1 tablespoonful of butter and flavouring until soft, and then spread out to set.

453,828. **Salting intestines prior to use as sausage skins.** T. A. DARRINGTON, 321, Smithfield Market, London, E.C. 1.

A machine is described by means of which cleaned and still wet intestines, or pieces of intestine, are thoroughly salted by drawing them more or less transversely through a bed of salt. An annular trough of salt is disposed round a moving drum, the latter being fixed above a rotating disc, which makes a sliding contact under the salt trough. Two sets of pins are mounted, one on the inner side of the trough, and fixed on the edge of the drum, and the other on the outer edge of the trough, concentrically. The skins are tied together in a hank by one end (which is previously salted by hand); the tied end is fixed in a notch formed by a special pair of pins further in on the drum, the hank passes round a guide, and the individual lengths are arranged between pairs of pins, so that they cross the salt transversely and separately. On continued rotation of the inner drum by hand pulley or other device the skins are drawn through the salt and wound on the notch pins holding the end of the hank. Deflector blades are arranged to turn over the salt and heap it in the centre of the trough, and new salt is continuously fed in through a hopper. Other devices are described for preventing loss of salt by scattering from the trough.

454,220. **Liquid refrigerants for perishable foodstuffs.** F. O. S. BLAND, 36, Eppendorferlandstrasse, Hamburg 20, Germany.

A liquid is used as a direct cooling medium for foodstuffs, etc., so that the freezing process is greatly accelerated. The liquid medium employed, which will not contaminate the foodstuff, is composed of two alcohols, one a multivalent and one a monovalent alcohol, and water; the preferred composition is 32 per cent. glycerine, 30 per cent. ethyl alcohol, and 38 per cent. water. The ingredients, previously mixed and stored at 17° C., are purified from undesirable constituents (*e.g.*, the sweet taste) by filtering through a filter containing three layers, the top one of fuller's earth, then magnesium oxide, and active carbon at the bottom. The liquid is then placed in troughs which run through a tank containing brine cooled to −30° C. by the usual refrigerators and pipe system; the treating liquid is thus cooled. The troughs are joined by plates over the top, so that no brine can splash over into the treating liquid. The foodstuffs pass through the liquid under the surface by means of an endless belt conveyor having suitable ledges to hold the articles, which are brought to or removed from the troughs by other conveyors. Rapid freezing is thus continuously effected.

LATEST TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

BEEF SUET.—569,375. **Beef suet.** JOHN CECIL ADAM and DOUGLAS ALEXANDER ADAM, trading as John Adam and Son, 78, Salamander Street, Leith, Edinburgh. November 4.

The trade mark is limited to the colours red, black, white, yellow, and orange, as shown in the representation on the form of application.

BIRD'S CUSTARD POWDER.—571,309. **Custard powder.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. (Associated.) November 4.

BIRD'S EGG SUBSTITUTE.—571,306. **Egg substitute powder (for food).** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. (Associated.)

Registration of this trade mark shall give no right to the exclusive use of the word "Golden".

BIRD'S IMPROVED CORN FLOUR.—571,307. **Corn flour.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. (Associated.) November 4.

BIRD'S RICE CUSTARD.—571,310. **Rice custard powder.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. (Associated.) November 4.

BIRD'S "SPONGIE".—564,531. **Sponge mixture.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham, 12. September 16. (Associated.)

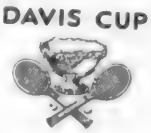
Advertised before acceptance, the applicants alleging distinctiveness.

BIRD'S YORKSHIRE PUDDING POWDER.—571,311. **Yorkshire pudding powder.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. (Associated.) November 4.

CŒUR DE LION. — 566,642. **Fresh citrus fruits.** SPINNEY'S, LTD., Jallal Building, Jaffa Road, Haifa, Palestine. (By Consent.) October 14.

CREAMOOR.—571,315. **Flour.** STANBURY AND SON, LTD., Victoria Mills, Barnstaple, North Devon. (By Consent.) November 4.

DAVIS CUP.—569,908. **Canned fruits.** LOUIS CAUFMAN GREENE and WALTER LESLIE HARCOURT, trading as Harcourt, Greene and Co., 260, California Street, San Francisco, California, United States of America. October 28.



Registration of this trade mark shall give no right to the exclusive use of the word "Davis".

FRESH SEAL.—B569,622. **Canned apples.** RAY-MALING CO., INC., Corner of Baselin and North Range Streets, Hillsboro', Oregon, United States of America. September 16.

User claimed from September 30, 1932.

FRO-JOY. — 567,053. **Chocolate covered ice-cream.** DICKY BIRD, LTD., Alfred's Way, Barking, Essex. (By Consent.) October 21.

GLYCYREX. — 570,849. **Substances used as food or as ingredients in food.** W. A. WAYLAND AND CO., LTD., U.K. Works, Gosterwood Street, Deptford, London, S.E. 8. September 16.

GOLDEN MIST. — 569,580. **Flour.** THOMAS, GATER, BRADFIELD AND CO., LTD., Bankside House, Leadenhall Street, London, E.C. 3. (By Consent.) October 28.

GONG.—560,299. **Substances used as food or as ingredients in food, but not including tea, and not including any goods of a like kind to tea.** OXO LIMITED, Thames House, Queen Street Place, London, E.C. 4. September 23. (Associated.)

GREEN CIRCLE. — 570,132. **Margarine.** BENNINGA'S BRITISH MARGARINE AND PRODUCE COMPANY, LTD., The Margarine Works, 33, Mortimer Road, Mitcham, Surrey. (By Consent.) November 4.

The Trade Mark, so far as regards the outer circle device, is limited to the colour green, as shown in the representation on the form of application.

G. & S.—571,314. **Substances used as food or as ingredients in food.** GOBLE AND SOTHERS, LTD., 112, Southwark Street, London, S.E. 1. October 14.

Registration of this trade mark shall give no right to the exclusive use of the word "Southwark".

KIDDY GLEE.—570,837. **Biscuits.** BURTON'S GOLD MEDAL BISCUITS, LTD., Buchanan Street, Blackpool. October 28.

KING KANDY. — 571,495. **Candy for food.** REDUERS HAMSON KING and PHYLLIS ANNE KING, trading in co-partnership, 8, Kingsway Mansions, 23a, Red Lion Square, London, W.C. 1. November 4.

Registration of this trade mark shall give no right to the use of the words "King Kandy".

LE MENTEC.—568,515. **Preserved fish, preserved vegetables, and preserved meats.** ÉTABLISSEMENTS F. DELORY, No. 24, Rue Paul Guieysse, Lorient, France. September 23.

In use upon goods other than sardines in oil the mark will be varied by the substitution of the name of such goods for the words "Sardines a l'Huile".

LON-VA. — 570,905. **Substances used as food or as ingredients in food.** WAUGH AND SERRA, LTD., 21, Fitzroy Square, London, W. 1. September 16.

M.—571,806. **Mushrooms.** CUCKLINGTON MUSHROOMS, LTD., Hale House, Hale Lane, Cucklington, Wincanton, Somerset. November 4.

Registration of this trade mark shall give no right to the exclusive use of the devices of mushrooms.

MERRIDELL. — 568,599. **All goods in Class 42.** CLEEVES, LTD., Cleevedale Park, 44, South Side, Clapham Common, London, S.W. 4. September 23. (By Consent.)

ORMVITA.—570,041. **Bread and biscuits.** ORMEAU BAKERY, LTD., 307, Ormeau Road, Belfast, Northern Ireland. (By Consent.) (Associated.) October 21.

PARTAYSON. — 571,080. **Sweetmeats, lemon cheese, and preparations of tomatoes, cheese, butter, and mustard for making sandwiches.** REGINALD BERTRAM TAYLOR and GEORGE ALFRED PARKINSON, trading as Parkinson and Taylor, 48, Queen's Drive, Liverpool, 15. October 28.

PLASTEX. — 571,052. **Edible oils and edible fats.** THOMAS HEDLEY AND CO., LTD., Phœnix Buildings, Collingwood Street, Newcastle-on-Tyne. September 16.

REDGATE & CO. (EXPORT), LTD.—569,617. **Cured hams (uncooked).** REDGATE AND CO. (EXPORT), LTD., 52, Southwark Street, London, S.E. 1. (Associated.) (By Consent.) October 21.

REDGATE.—569,886. **Substances for use as food or as ingredients in food.** REDGATE AND CO. (EXPORT), LTD., 52, Southwark Street, London, S.E. 1. September 16. (Associated.)

RIVER FRUITS.—569,123. **Fruit jellies (for food).** AGELVAS, LTD., River Works, Putney Embankment, London, S.W. 15. October 28.

SAN-TAM. — 570,917. **Tea, coffee, and cocoa.** ROY GREENWOOD, trading as Greenwood and Co., 63, London Road, Preston, Lancashire. October 14.

SERRICO. — 569,802. **Tinned tomatoes, tinned asparagus, tinned apricots, and tinned Portuguese sardines.** WAUGH AND SERRA, LTD., 21, Fitzroy Square, London, W. 1. September 16. (By Consent.)

SMILING THRU.—569,904. **Fresh fruits.** CALIFORNIA FRUIT EXCHANGE, Blue Anchor Building, 1400, Tenth Street, Sacramento, California, United States of America. October 28.

STANMEAL. — 571,318. **Wheatmeal.** STANBURY AND SON, LTD., Victoria Mills, Barnstaple, North Devon. (By Consent.) November 4.

VARSITY.—571,992. **Pickles and sauces.** H. SMITH (PURITO PRODUCTS), LTD., Charlestown Mill, Whit Lane, Pendleton, Salford. November 4.

VENTURE.—569,259. **Sardines.** FACOLE FABRICA DE CONSERVAS LEIXOES LIMITADA, rue de Guerra Junqueiro 609, Matozinhos, Portugal. October 28.

WHITE PRINCE.—572,163. **Edible oils and edible fats.** LOUIS LEVI GORDON, trading as Hull Supply Company, 12 to 16, Blanket Row, Hull. November 4.

X.—571,534. **Cooked meats and sausages.** H. READ, LTD., Prospex Works, 71, Rigby Street, Higher Broughton, Salford, 7. November 4.

Registration of this trade mark shall give no right to the exclusive use of the letter "X".

568,865.—**Cheese, fresh milk, cream, and butter.** BEE BROS., LTD., Bee Dairy, Wham's Lane, Bay Horse, near Lancaster. September 23.

570,624.—**Substances used as food or as ingredients in food, but not including flour, and not including any goods of a like kind to flour.** NESTLÉ'S MILK PRODUCTS, LTD., 6 and 8, Eastcheap, London, E.C. 3. (Associated.) (By Consent.) October 21.

570,724.—**Tea, coffee, and coffee essence (for food).** R. DRYSDALE AND CO., LTD., 31, Albany Street, Edinburgh. September 23.

570,986.—**Substances used as food or as ingredients in food.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham. September 30. (Associated.)

571,009.—**Tea, coffee, cocoa, and chocolate.** R. TWINING AND CO., LTD., 216, Strand, London, W.C. 2. September 30. (Associated.)

571,588.—**Substances used as food or as ingredients in food.** NEW ZEALAND HONEY CONTROL BOARD, 28, Stanley Street, Auckland, New Zealand. (Associated.) November 4.

NEW COMPANIES

Masons' Table Water Company, Limited. (318,441.) To take over the bus. of mineral water mnfrs. cd. on at Mill Street, Plymouth, by E. and J. Mason. Nom. Cap.: £3,000. Dirs.: E. Mason, 89, Poplar Avenue, Birmingham, 17; J. Mason, 100, Poplar Avenue, Birmingham, 17; F. A. Mason, "Brum," Dunclair Park, Plymouth; W. T. Mason, "Windsor," Dunclair Park, Plymouth.

Meat Products, Limited. (318,376.) 362, Mile End Road, E. 1. To carry on the bus. of manfrs. of and dlrs. in tinned and bottled foodstuffs and preserved meats, etc. Nom. Cap.: £100. Dirs.: W. J. M. Matthews, 1, Fir Tree Court, Sheen Gate Gardens, S.W. 14; Sophia Lax, 362, Mile End Road, E. 1.

Newlines, Limited. (318,209.) 19, Eastcheap, E.C. 3. To carry on the bus. of mnfrs. of and dlrs. in jam, preserves, etc. Nom. Cap.: £100. Dirs.: A. Kennard, 26, Burnham Court, Hendon, N.W. 4; L. Hiller, 63, Guinness Flats, Stamford Hill, N. 16.

Pepsi-Cola, Limited. (317,854.) To carry on the bus. of mnfrs. of and dlrs. in mineral and aerated waters, etc. Nom. Cap.: £25,000. Dirs.: J. B. Hillary, C. Burdett and C. G. Guth, addresses not stated. Qual. of dirs.: £1. Remun. of dirs.: As voted by the company. Subs.: G. S. F. Barham, 13, Willoughby Road, N.W. 3 (solicitor), and M. Parker, 90, Garland Road, S.E. 18 (clerk).

Purefruit Preserving Company, Limited. (319,076.) To carry on the bus. of mnfrs. and vendors of jams, preserves, etc. Nom. Cap.: £2,000. Permt. dirs.: H. Fielden, "Lyndhurst," Polwarth Place, Gosforth, Newcastle-on-Tyne; E. C. Pringle, 30, Seventh Avenue, Heaton, Newcastle-on-Tyne; Margaret Dawson, address not stated.

Reedham Mushroom Cultivation, Limited. (318,381.) Riverside, Reedham, Norfolk. To acquire the goodwill of the bus. of mushroom cultivation cd. on at Norfolk as "The Reedham Mushroom Cultivation Co." Nom. Cap.: £1,000. Dirs.: W. H. Birrell, The Nook, Riverside, Reedham, Norfolk; Honora Birrell, The Nook, Riverside, Reedham, Norfolk.

Refrigeration and Maintenance Company, Limited. (319,080.) To take over the bus. cd. on at 351, King Street, Hammersmith, W., as the Economic Refrigeration and Maintenance Co. Nom. Cap.: £3,000. Dirs.: L. Gorringe, 353A, King Street, Hammersmith, W. 6 (permanent); H. L. Gorringe, 353A, King Street, Hammersmith, W.; A. B. Freeland, 85, Dora Road, Wimbledon Park, S.W. 19 (permanent); D. H. Freeland, 85, Dora Road, Wimbledon Park, S.W. 19.

Scott's Potato Crisps, Limited. (318,060.) 70A, Basinghall Street, E.C. 2. To carry on the bus. of potato crisp mnfrs. and mchts., etc. Nom. Cap.: £2,000. Dirs.: J. M. Scott, 6, Parham Drive, Ilford, Essex; Lt.-Col. W. B. Anderson, 69, Mansfield Road, Ilford; E. E. Hall, 50, Vaughan Gardens, Ilford. Qual. of dirs.: 1 share.

Starch-Free Foods, Limited. (317,831.) 48, Mark Lane, E.C. 3. To carry on the bus. of mnfrs. of flour, yeast and other ingredients used by bakers and confectioners, mnfrs. of foodstuffs and commodities, etc. Nom. Cap.: £30,000. Dirs.: C. M. T. Irving, 27, Conduit Street, W. 1 (chairman); G. N. Reeves, Hamsey Lodge, Lewes, Sussex; S. P. Rety, 3, Taylor Avenue, Kew; and C. L. Cleburne, 31, Upper Richmond Road, S.W. 15. Remun. of dirs: £100 each per annum (chairman £150).

Transport Refrigeration, Limited. (318,584.) Morley House, 26, Holborn Viaduct, E.C. 1. To carry on bus. as mnfrs. of and dlrs. in refrigerators and cold storage machinery, etc. Nom. Cap.: £1,500. Permt. dirs.: W. J. Chaney, 23, Oakington Avenue, Wembley Park, Middlesex; T. H. Kino, 1, Duchess Street, Portland Place, W. 1; T. Cohen, 15, Campden Hill Gate, W. 8.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

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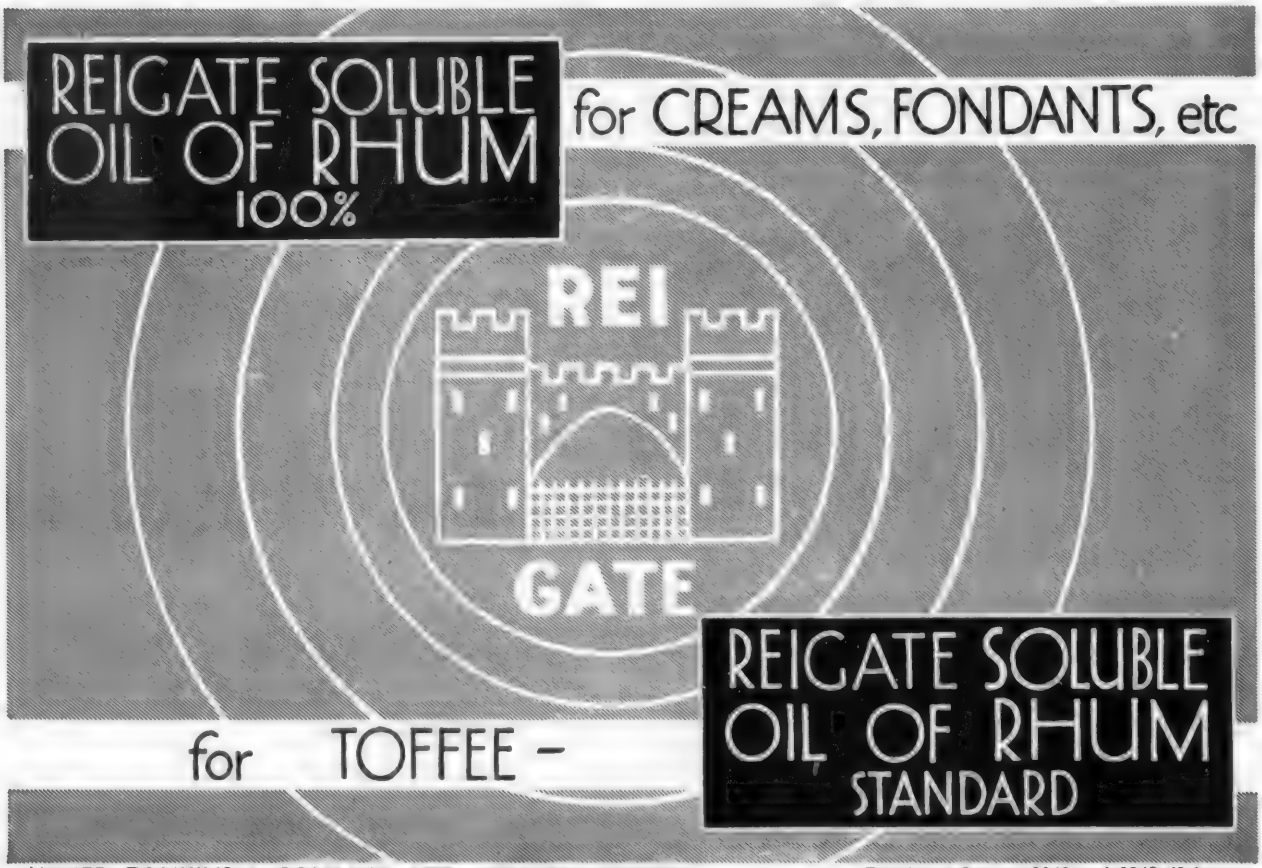

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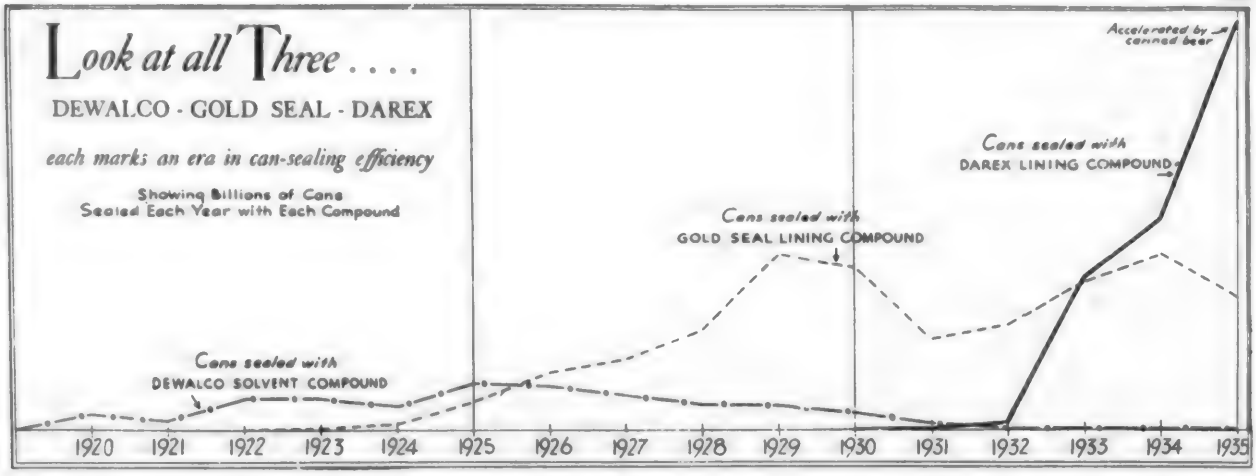
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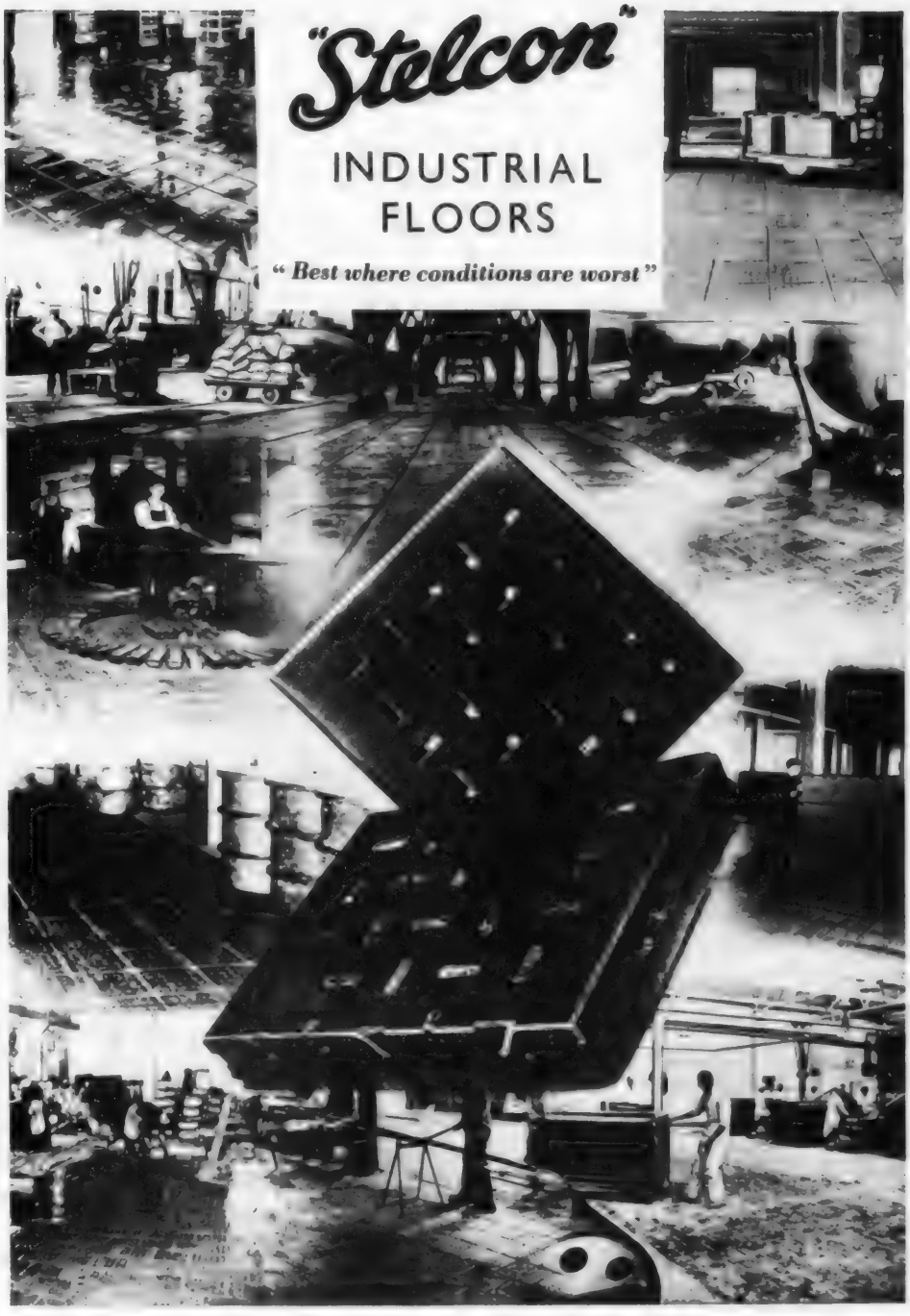

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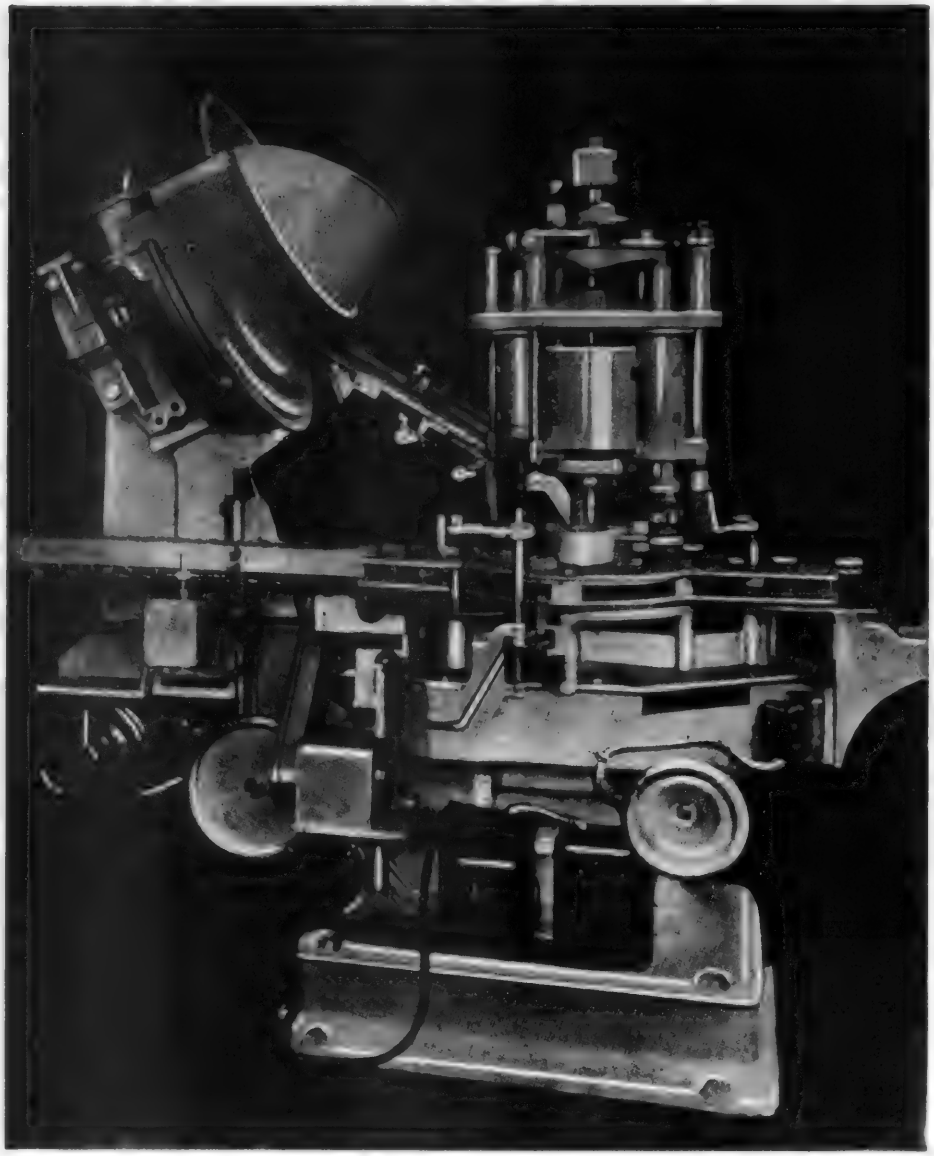

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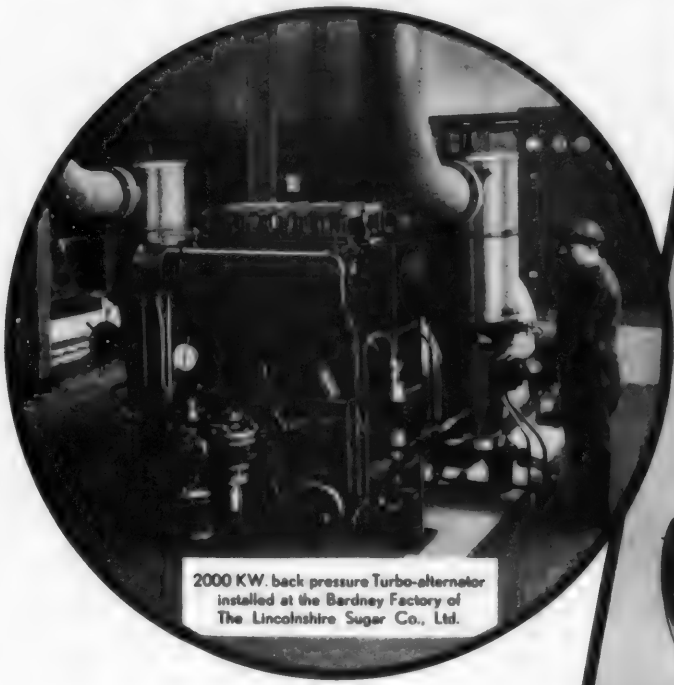

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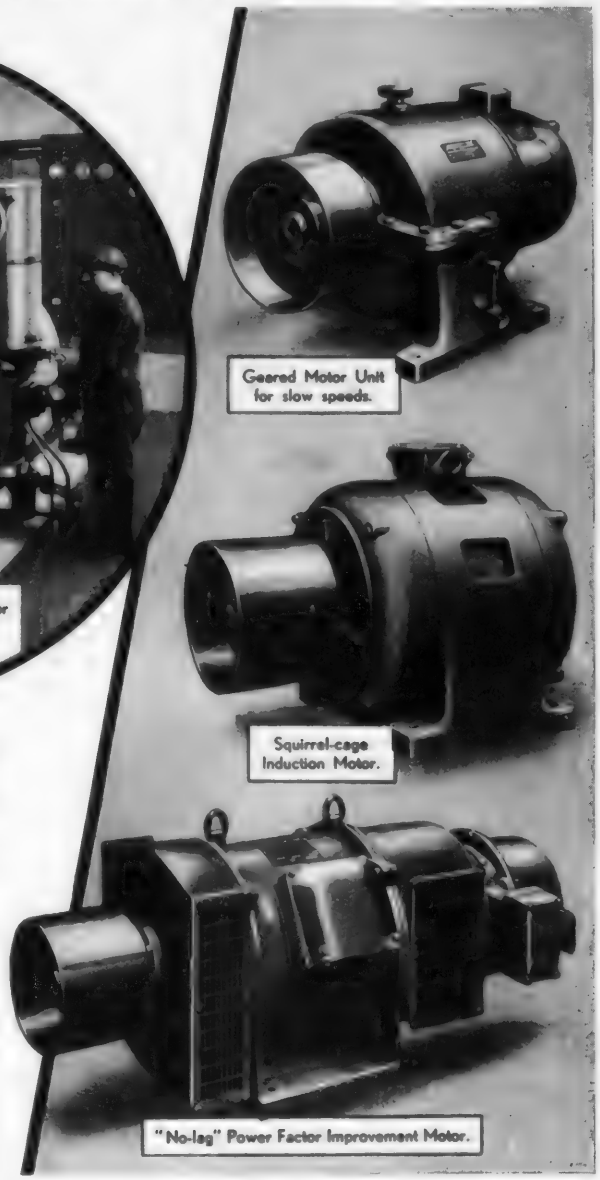

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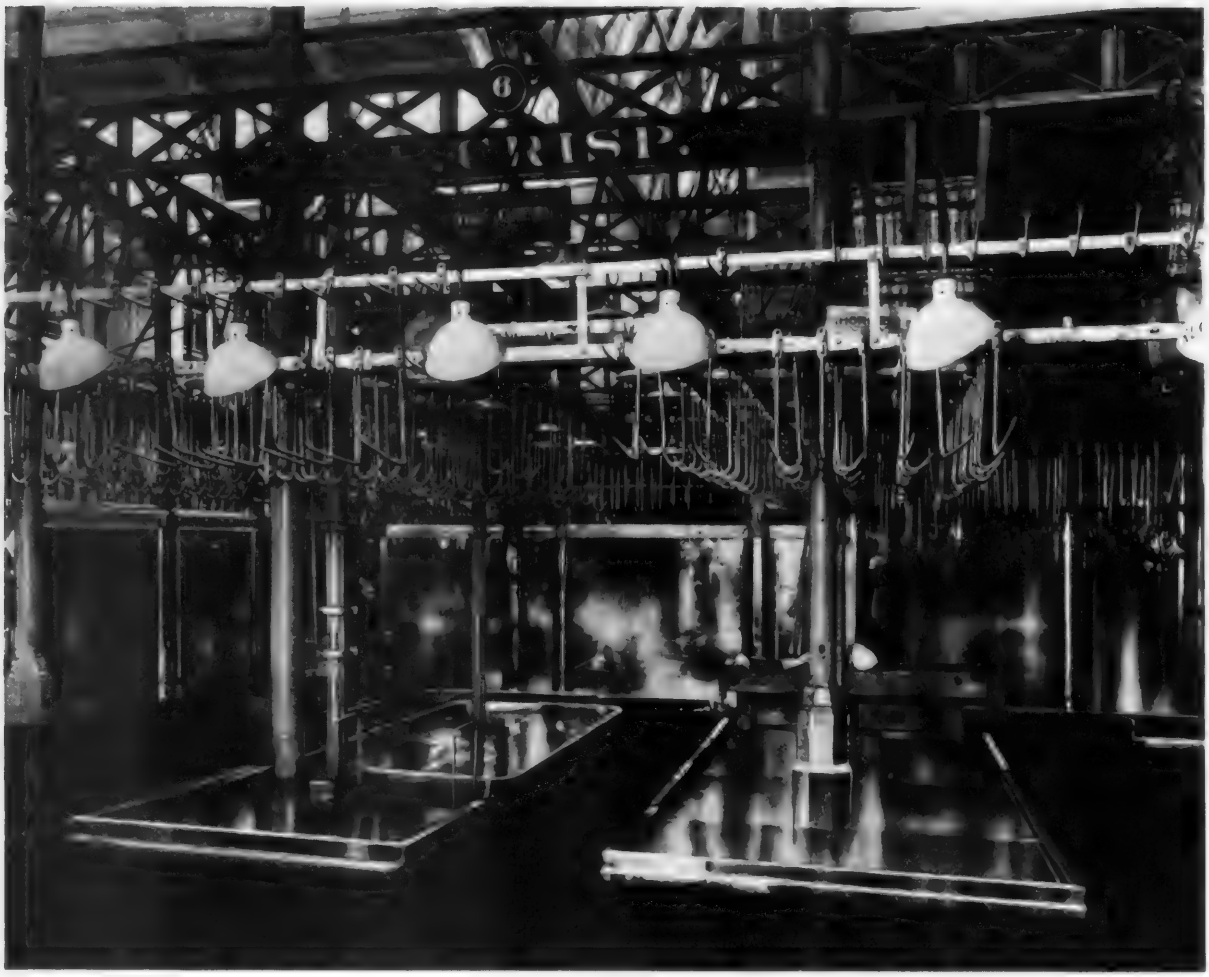

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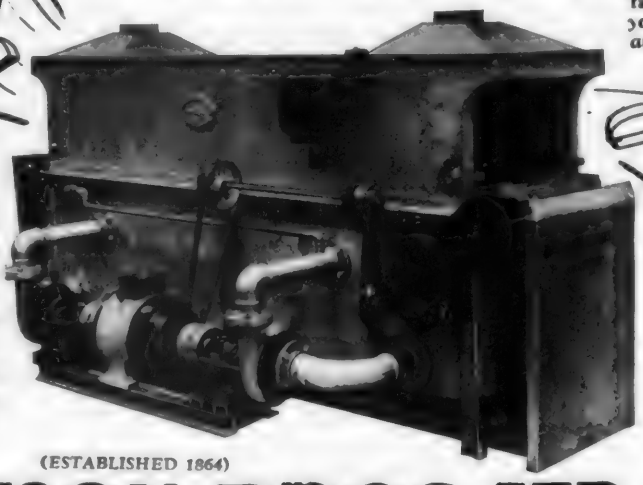

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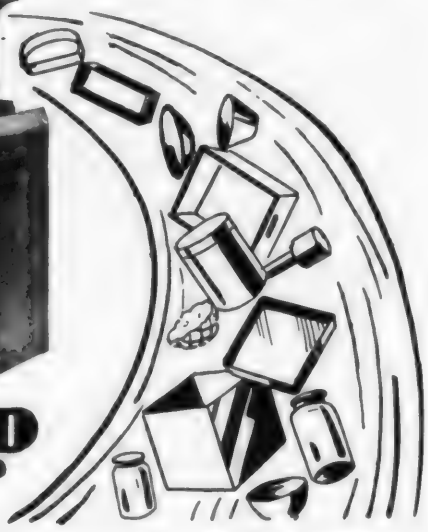

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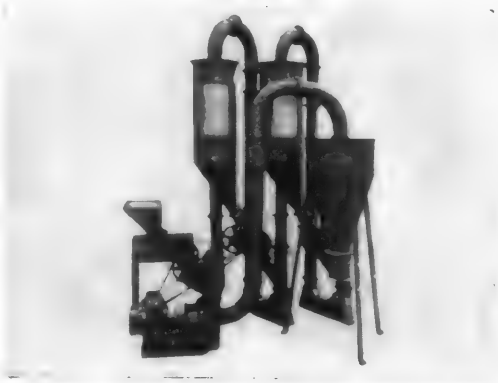

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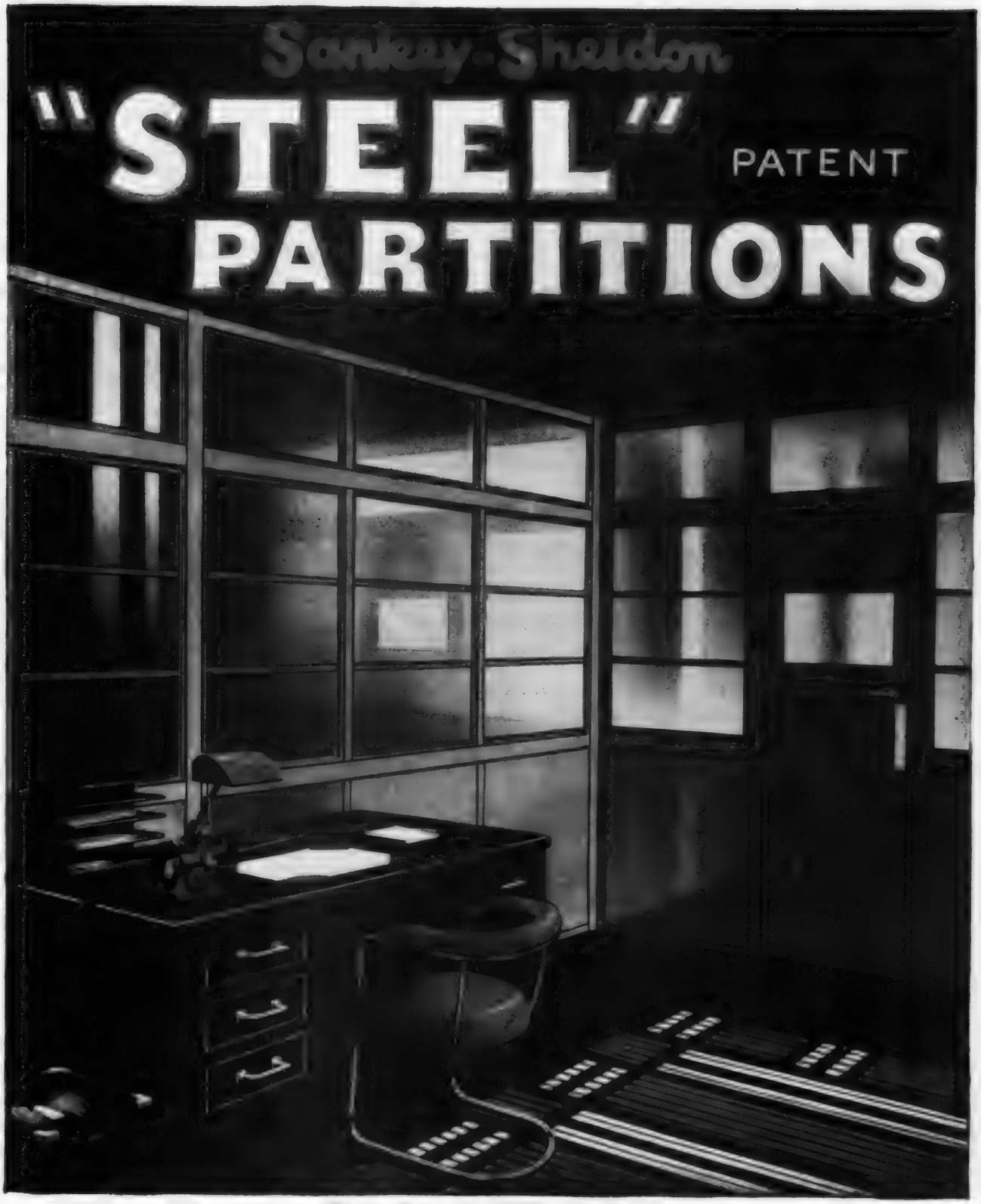

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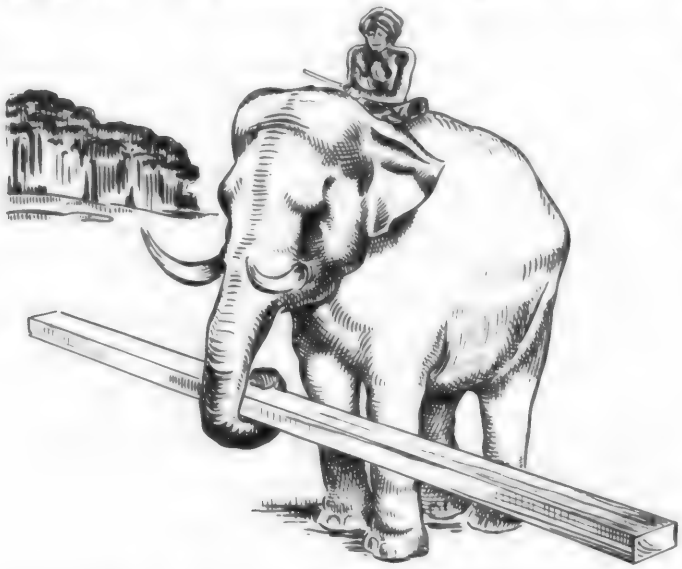

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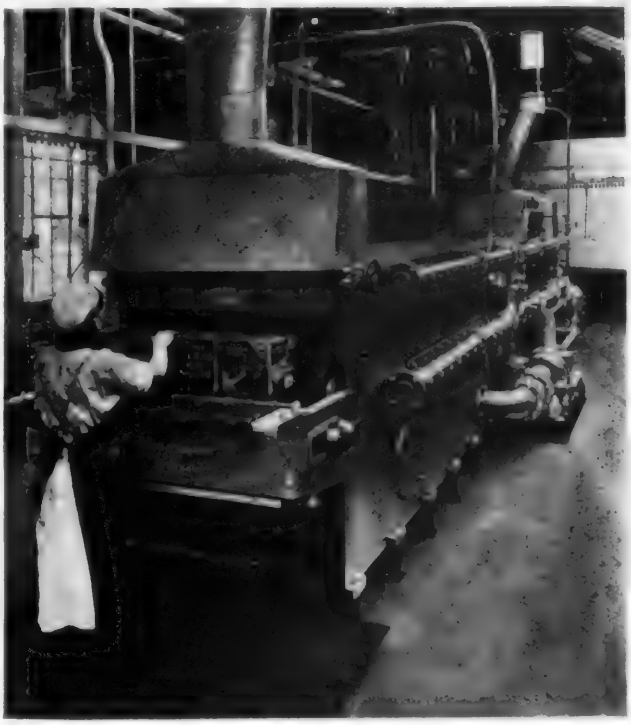
Photograph by the courtesy of Messrs. Macfarlane, Lang & Co. Ltd., Glasgow.



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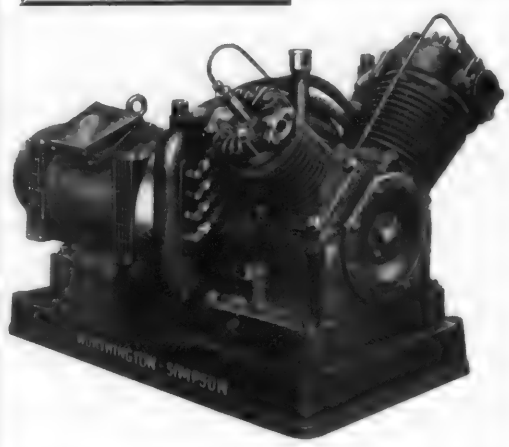

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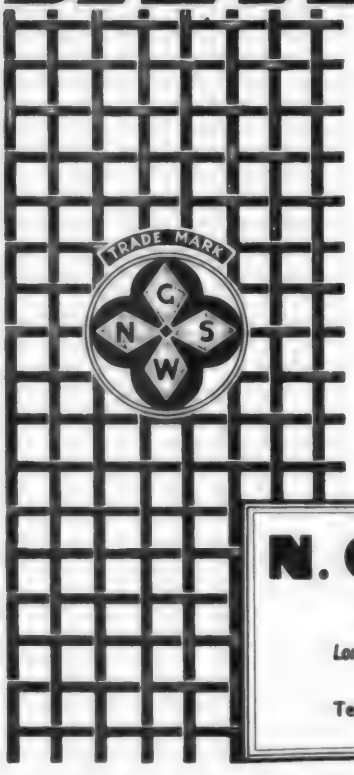

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WALWORTH Service Bulletin

No. 10. Vol. I. DECEMBER

BE PRACTICAL....

ALTHOUGH the phrase "What you want when you want it" may not be a very elegant one, it expresses a policy clearly and concisely, and is therefore very practical.

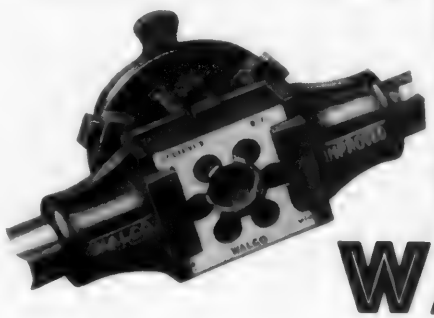
That business houses, in order to operate in an economical and orderly fashion, must have their rules and regulations, is a contention that will not lightly be challenged. Such rules, to be useful, must of necessity cover most conditions, but it should not be overlooked that rules are servants and not masters, and they should be broken when they interfere with the true purpose of the business.

So let us be practical! Every business organisation needs one responsible, intelligent rule breaker.

WALCO IMPROVED DIESTOCK

THE "WALCO" Improved Solid Diestock with self-locking adjustable guide embodies an important and practical improvement on an old tool. While retaining all the advantages of the original tool, it has some very important improvements, including a new method of holding the die, a self-locking adjustable guide, and a six-land relieved die. The self-locking guide is adjusted to any size up to 1 in. gas tube by simply turning the guide plate until the guides touch the work. This diestock takes any die that will fit a No. 1 Walworth Diestock.

The die enters he holder from the side, doing away with toose plates and screws, while the die "seats1" when working on the machined underside of two remaining lugs.



COPPER TUBING FOR DOMESTIC PLUMBING

IN the past 5 or 6 years, Copper Tubes have invaded a market where they were seldom found before—namely, domestic plumbing and sometimes heating.

This has been possible because copper is about half the price it was in the 20's and two-thirds of the "pre-war" price.

Light gauge Copper Tubes have been approved by most public bodies, and the Ministry of Health have recognised its use by adopting a specification which is so practical that it is usually followed even on work where the M.O.H. does not govern.

Another development that has made Copper Tube economically possible has been the smooth joint fitting, which requires no thread, thus permitting the use of a much lighter gauge tube.

There is a great variety of smooth joint fittings, but one very much in favour now is the "Yorkshire" Capillary type of fitting. The bonding metal is put *in* the fitting by the manufacturer so the fitter only has to clean and flux the tube and apply a blow lamp. There is ample solder to make a perfect joint, but not enough to cause any obstruction in the tube.

Joints are made quickly, and when an installation is finished it is virtually a one-piece job.

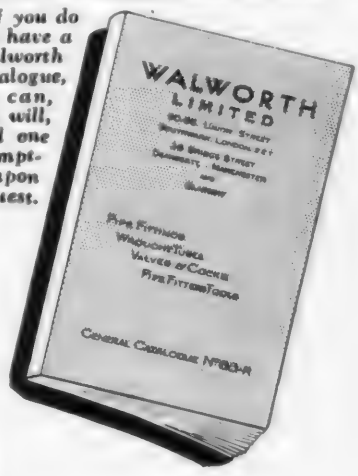
The use of Copper Tube and Yorkshire Fittings is now made practical for the small jobs, as well as big, by our London stocks from which immediate deliveries can be had.

AN APOLOGY AND A PROMISE

WE owe an apology to those customers who have been kept waiting for a Walworth Catalogue.

For a time the demand exceeded the supply, but with the co-operation of the printers, we are now in a position to meet all demands for this easy reference for every buyer of tubes, fittings, valves and tools.

If you do not have a Walworth Catalogue, we can, and will, send one promptly upon request.



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TUBES - FITTINGS - VALVES - TOOLS

(P.P.29)

Food preparation, and a remarkable motor

BY "TORQUE"

The Crompton "Minor" motor offers such obvious advantages to the food manufacturing industry that it is not surprising to find it incorporated very extensively in modern plants. Some applications of interest are described here, and brief consideration is given to some of the special features incorporated in this motor.

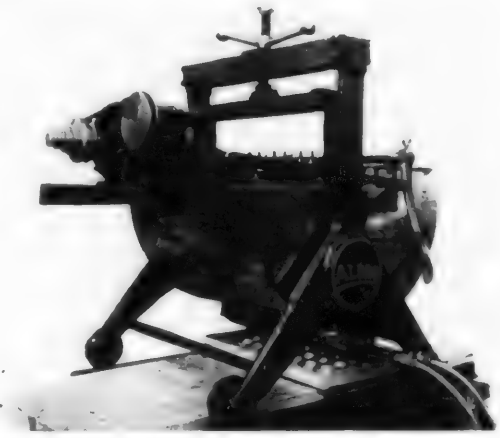

Fig. 2
The Crompton "Minor" Motor on a multiple depositing filler with agitator. It has a capacity of 7,000 per hour. The "Minor" effects the agitation through reduction gearing and a crank lever.

MODERN food-filling machinery offers an efficiency which is in every way capable of fulfilling the requirements of present-day high production methods. There is little doubt that the peak of efficiency which these machines have attained is the effect rather than the cause of contemporary production requirements. Production has steadily increased, and consequently ingenious design and studied development with the requirements always clearly in view have both had to be applied. There have been three main points to be satisfied: the provision of a capacity comparable with the requirements, a high efficiency, and complete reliability in operation.

The Designer is limited by component units of his machine.

The first is entirely a matter for the machine designer. The other two are also dependent to a great extent on him, but here he in turn is limited by the capabilities of individual units.

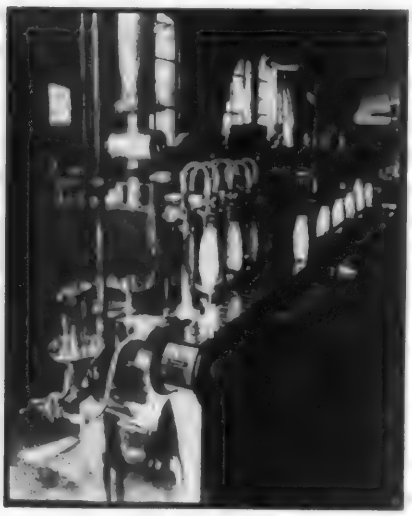

Fig. 1
An Albro 3-head, semi-automatic, vacuum filling machine. This machine fills 150 dozen 9 ounce sauce bottles per hour. Like many other machines in the food industry, it derives power from Crompton "Minor" Motors. Albro Fillers & Engineering Co. Ltd.

Electricity has become the main source of power for food manufacturing plants because in addition to offering ease of control it provides certain other advantages, among them cleanliness. The designer must therefore be in a position, realising the enormous number of electrical motors which are employed in the industry, to place complete confidence in his power source, the electric motor. Without that, the potential efficiency of the plant is impaired to such an extent that it can never safely take its place in a high productive line.

Fractional horse-power motors are used throughout the industry. Unless they are reliable they are useless.

Some idea of the extent to which fractional horse-power motors are applied is given by the few examples shown here. In the Albro vacuum filling plant shown in Fig. 1, one fractional horse-power motor is housed inside the machine and drives both the vacuum pump and operating gear, a separate motor operating the conveyor. This machine is of the 3-head vacuum filling semi-automatic type with a capacity for filling 150 dozen 9-ounce sauce bottles per hour. Another machine manufactured by the same concern is shown in Fig. 2. This is a multiple valve depositing filler with agitator. The machine supplies pastes to the container in a hot condition, filling 7,000 containers an hour. A fractional horse-power motor effects the agitation through reduction gearing and a crank lever. In both these examples the motor used is the Crompton "Minor." Many other applications for this motor can be mentioned, such as capping machines, pie making and kneading machines. A special "Minor" has been developed also for use where slow speeds are required, such as for conveyors. This, the GRD "Minor," is a standard flange type motor built integral with a reduction gear unit. Speeds as low as 26 r.p.m. can be obtained.

The Crompton "Minor" has been designed for even more difficult conditions than these.

For the majority of these applications, the motor has not to contend with the difficult conditions imposed by other industrial applications, where overloads must be

Fig. 3
A hoseproof "Minor" operating a bottle conveyor. This motor finds extensive application in the industry where complete protection is required. Graham-Enock Manufacturing Co. Ltd.

taken into consideration, and the possibility of imposing a strain on the bearings or other vital parts. In one industrial application, for instance, where a "Minor" is employed to drive the fan for a gas-fired boiler, an end thrust of some 25 pounds is imposed on the motor shaft. The motor, in addition, operates in a high ambient temperature.

The important point is that the "Minor" has been so designed that if such conditions should arise it has plenty in reserve to cope with them. It is reasonable, therefore, that where the same motor operates under congenial conditions the element of doubt as to its providing reliable and continuous service indefinitely is so small that it need never come into consideration.

The margin of safety in the "Minor" gives the designer scope.

For such applications it can be installed and then forgotten. It removes with certainty one of the limits with which the designer of food manufacturing machinery is normally confronted. In actual fact the Albro Fillers and Engineering Co. Ltd. have supplied machines similar to those illustrated here, which have been in service for as long as nine years. During that time, it is improbable that the motor has ever even received a thought. It is certain that it has never caused trouble. But even should occasion ever arise for replacements the policy on which these motors are manufactured would minimise the hold-up. The range is strictly standardised, all component parts being manufactured to very fine tolerances. Consequently any component can be supplied from stock. The quality of manufacture reduces fitting and in many cases eliminates it entirely. Another feature which assists the designer is that all A.C., single phase, and 3-phase machines for any given capacity are strictly interchangeable.

These motors cover the entire field.

For all normal purposes the drip-proof "Minor" provides all the protection necessary. There are applications, however, where more protection is required against dust and dirt than can be provided by a drip-proof construction. For these the totally enclosed "Minor" will provide ample protection. Occasion does arise sometimes where even total enclosure would be insufficient. Such a case is the application shown in Fig. 3 on an installation supplied by Graham-Enock Manufacturing Co. Ltd. For such purposes the hose-proof "Minor" is strongly recommended. Splashing liquids or extraneous matter of any sort cannot effect this motor. It can even be "hosed down" with safety. The enclosure provides complete security against ingress of fluid or dirt. This range of motors, in fact, offers a solution to fractional horse-power applications throughout the food manufacturing industry.

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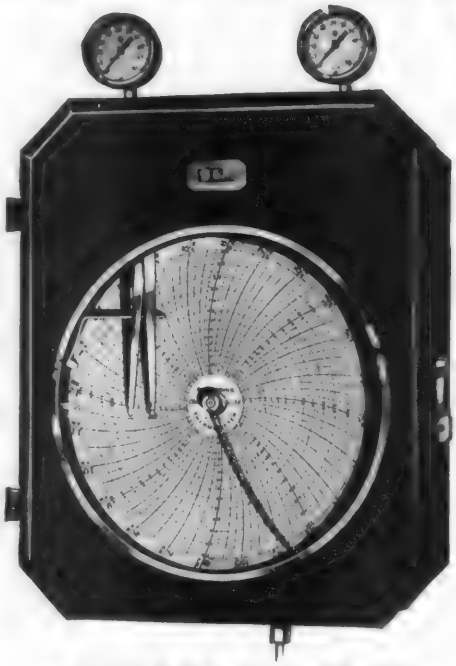

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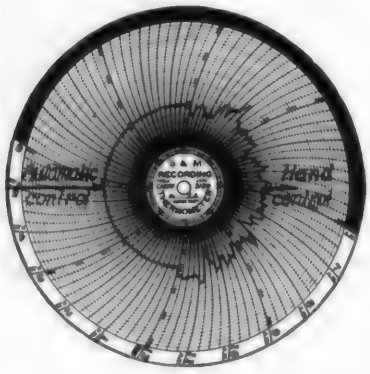

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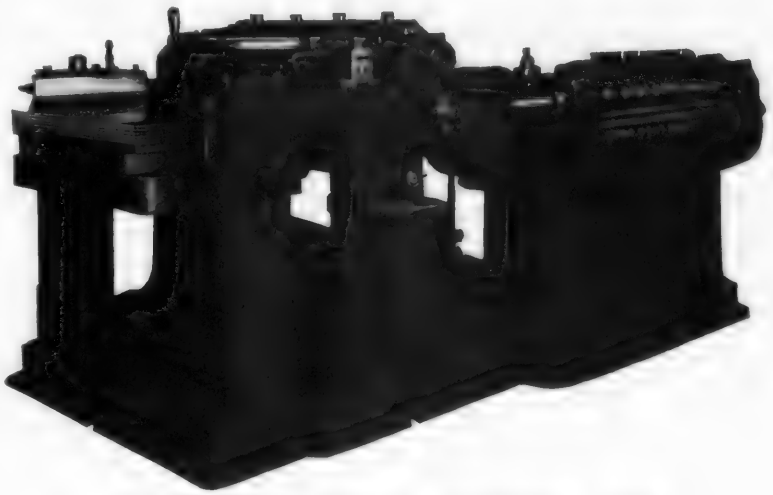


This is the modern device for making the body-blanks used in can manufacture.

It operates with a minimum of labour, cuts with great accuracy, and has a large output.

Cameron now owns the Slaysman basic patent on this device.

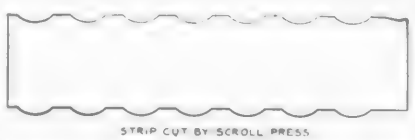
This machine and the one below have the excellent, new, tin-package Lifter.

No. 120 Duplex Trimmer and Slitter with Tin-Package Lifter

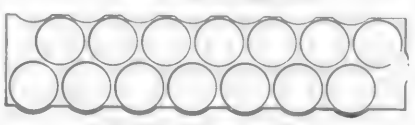
This improved machine cuts the scroll-strips that are used by the Automatic Press for the high-speed production of can-ends.

Scroll-strips represent a saving of material up to 7%.

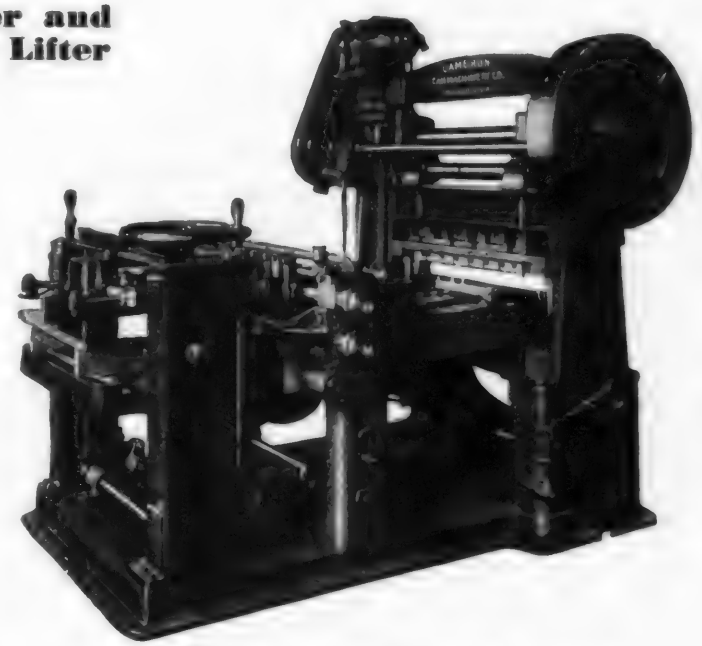
Ten-package bundles, or 1,120 sheets of tin plate, as they now come from the mill, are loaded by a shop-truck directly into the "Lifters" of these two modern machines.



STRIP CUT BY SCROLL PRESS



STRIP AFTER CUT WITH DOUBLE DIE



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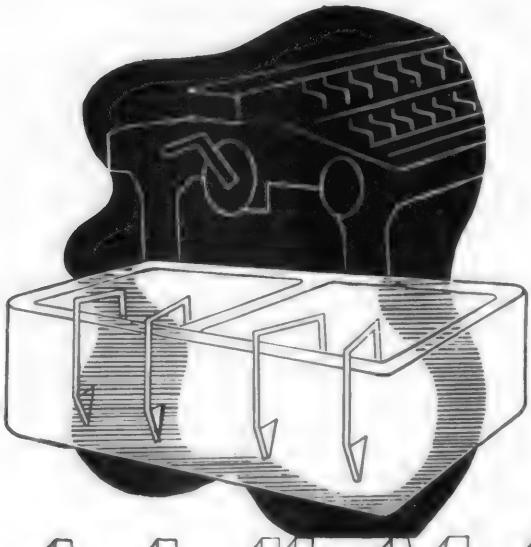

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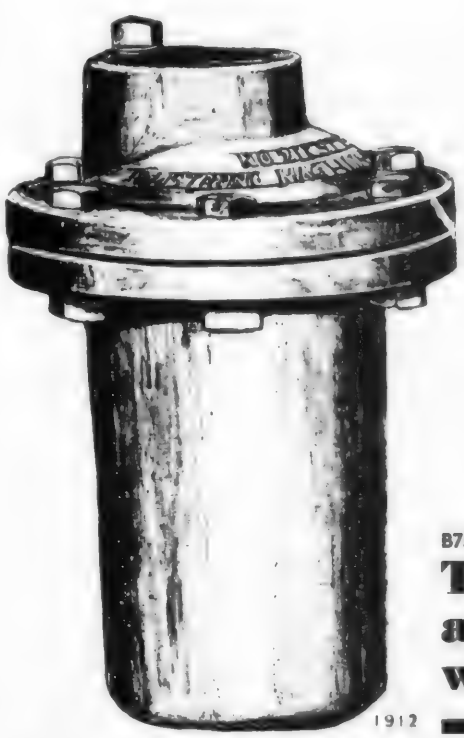

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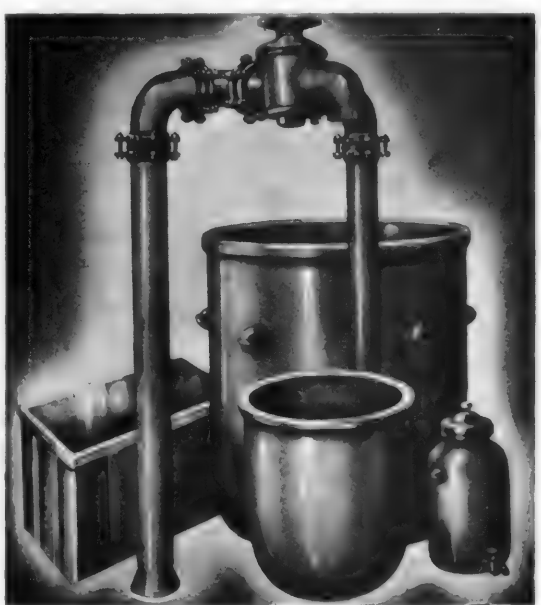

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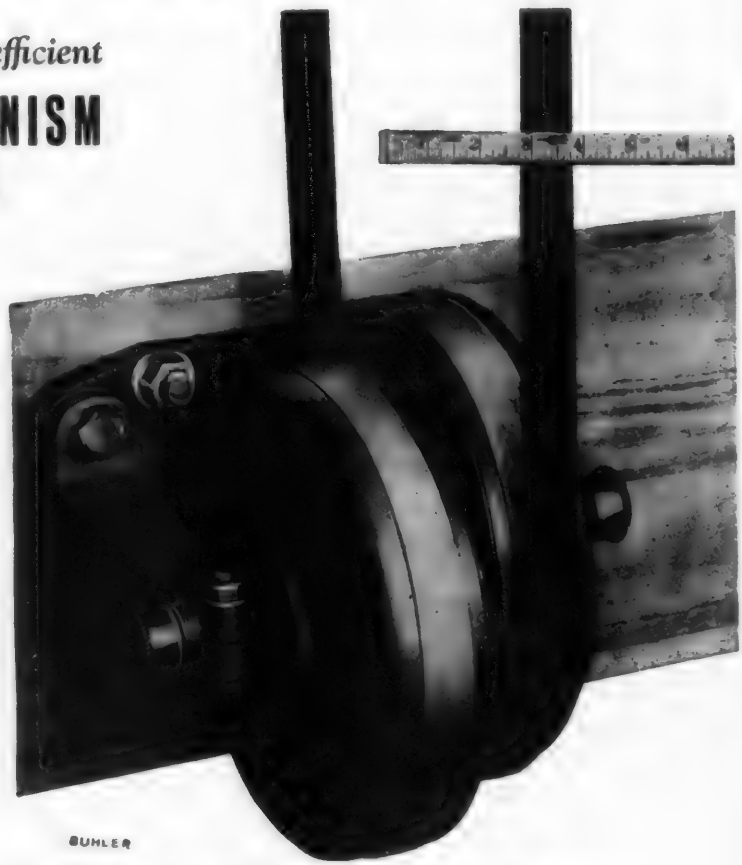

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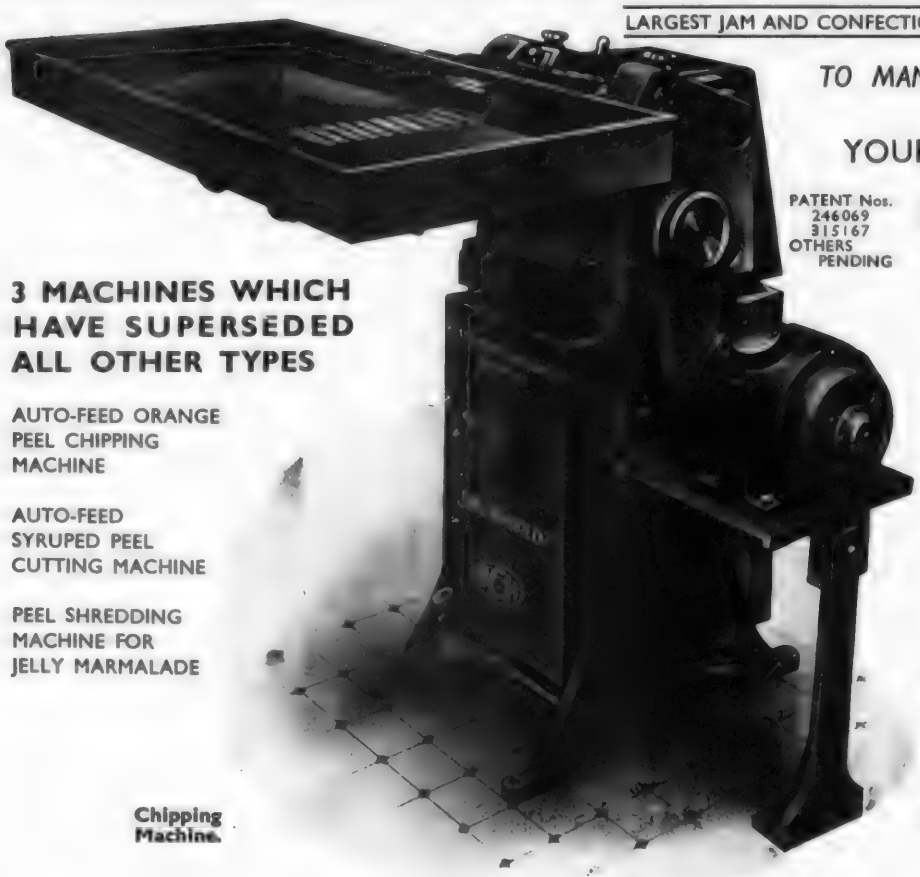

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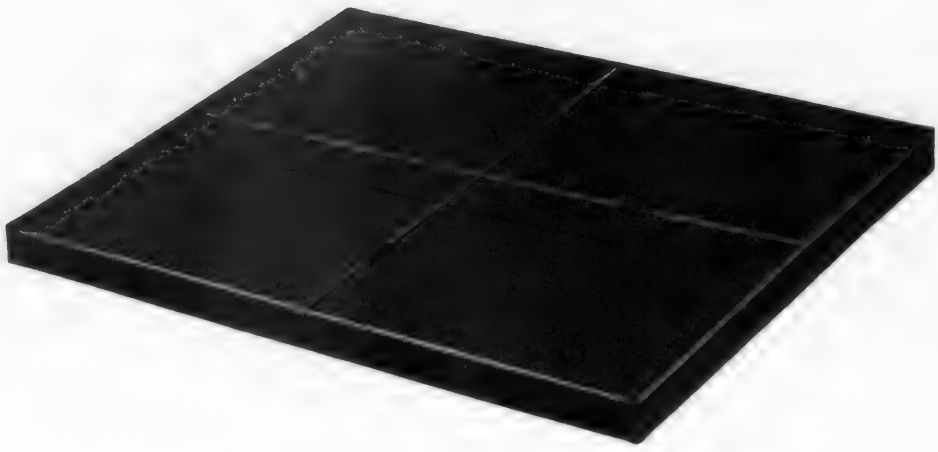

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3ft. 4ins. dia. by 6ft. 0ins. deep

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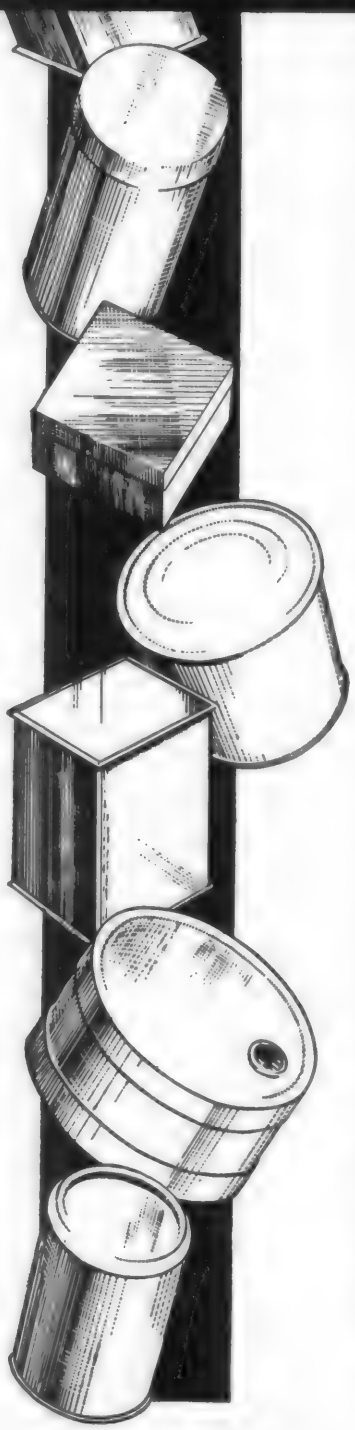

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The Corn Products Company brought an entirely new precision and efficiency into the glucose trade.

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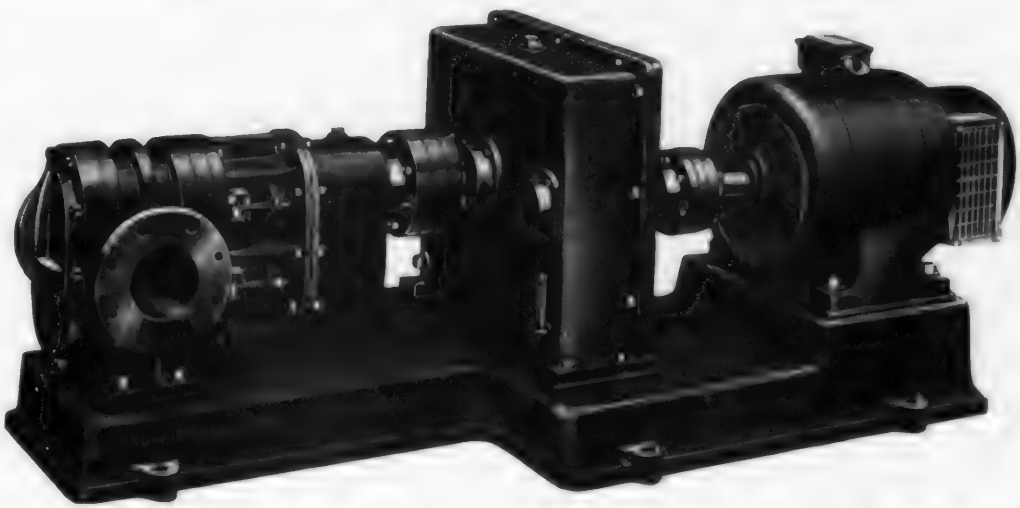

OR PUMPING WATER /

THERE'S A 'DRUM' PUMP TO DO IT !

The Pump illustrated above has recently been supplied for pumping heavy beet molasses—20 tons per hour against 100 to 120 lbs. per square inch. All moving parts are supported upon roller bearings—the rotor on special stainless steel roller bearings working in the molasses. This is typical of "Drum" special purpose pumps for the Food Industry.

There is a "Drum" Pump for every duty, to handle liquids as viscous as molasses or as mobile as water. Sizes from ½ inch upwards to handle from 150 gallons to 250,000 gallons per hour.

"Drum" pumps are reversible in action, can be steam jacketed, and are suitable for any form of drive.

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- POSITIVE ACTION
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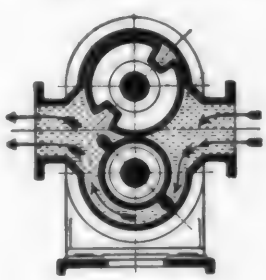
- CAN BE STEAM JACKETED
- VALVELESS AND NO AIR VESSELS
- RUGGED CONSTRUCTION

DRUM ROTARY PISTON PUMP



The revolving piston gives a continuous flow without pulsation, churning or forcing through small passages—this feature is particularly useful for emulsions or suspensions whose equilibrium is not thereby disturbed.

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D.R. 11

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"NIAGARA" ONE-GUN WASHER

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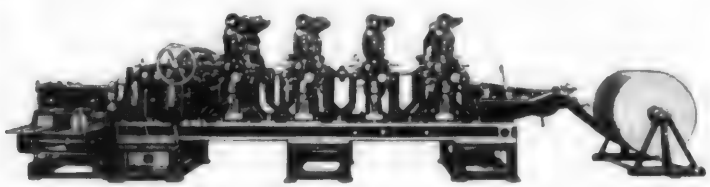

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Feed a plain reel of material into one end of this machine: the completely printed and cut article comes out at the other. Here is the reason why Simplex machines are the best for this type of work. They telescope into one quick operation all these processes: cutting, creasing or scoring, embossing, bronzing, multi-colour printing, counting, stacking, delivering free of waste.

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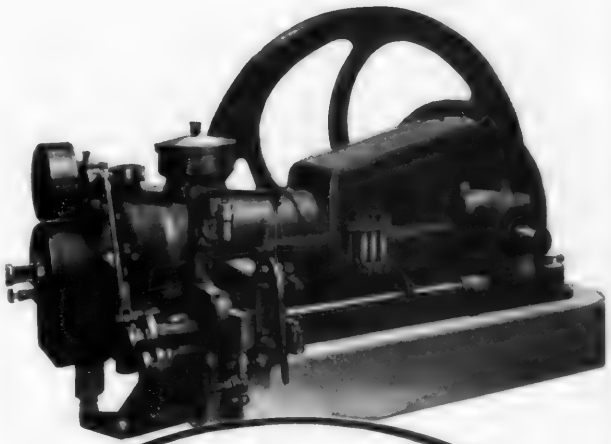

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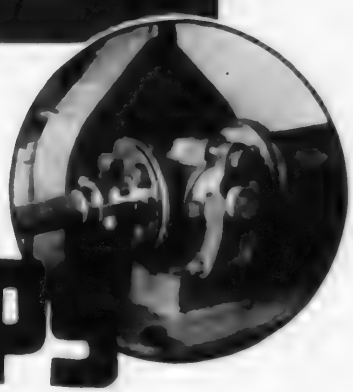

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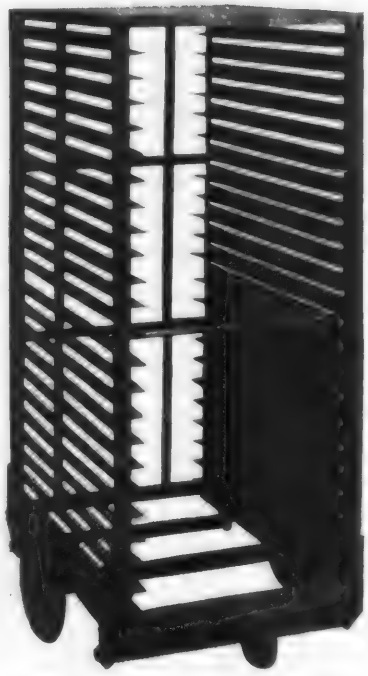

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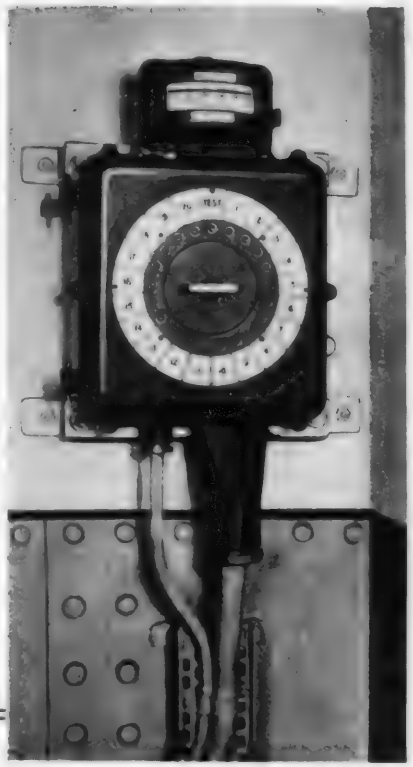

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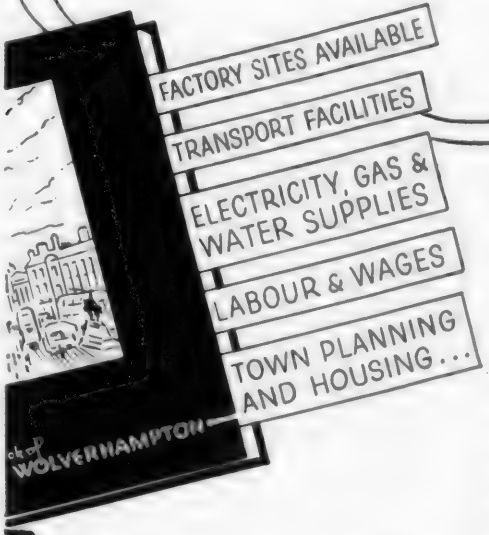

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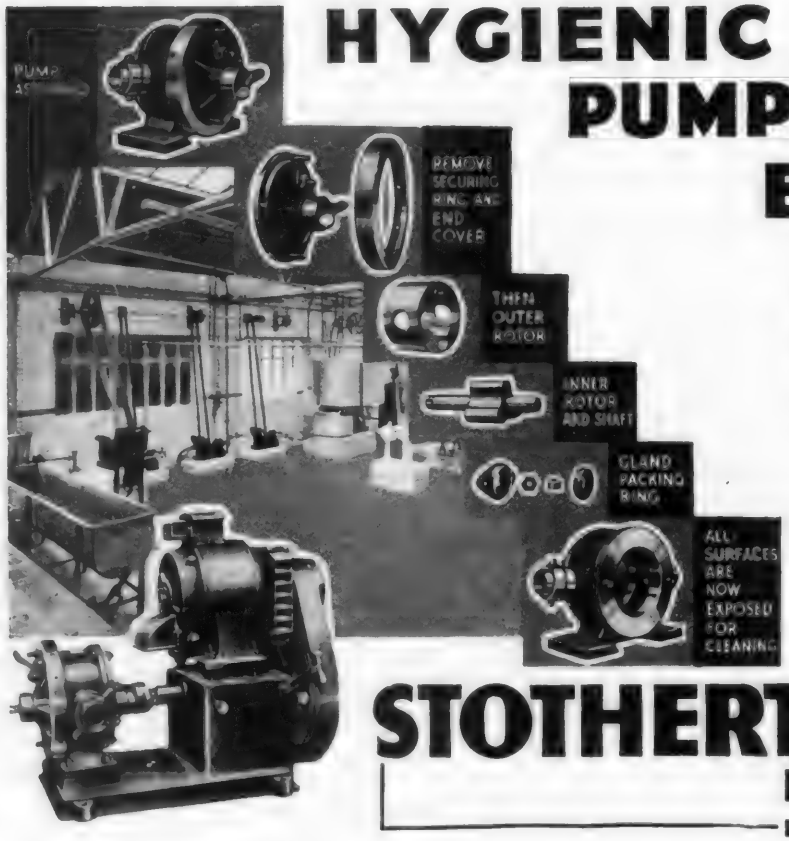
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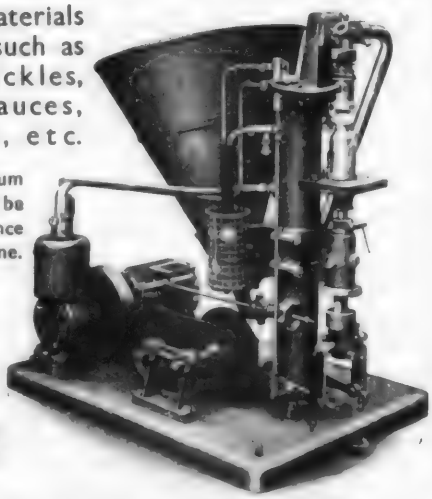

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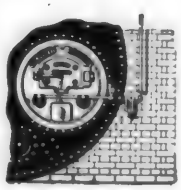

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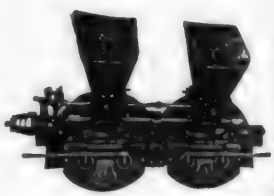

2. **Mechanical Stokers** give all the above and more by reason of the even and thin fuel feed and the fact that the firedoors are not opened.

The latest Fan Forced Draught, and with self-contained drive by electric motor.

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"F" (Furnaces)
"S" Stokers
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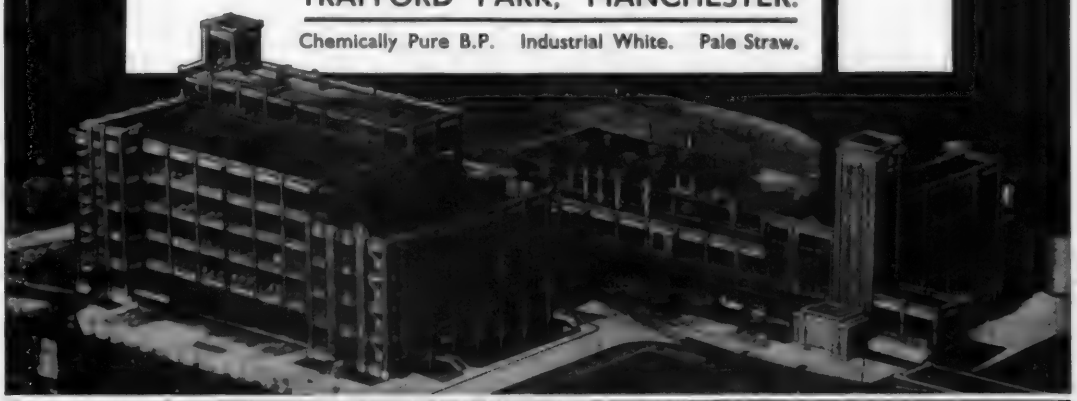

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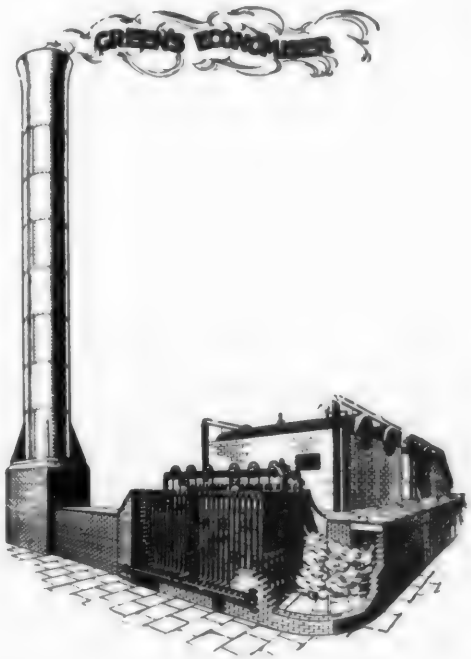

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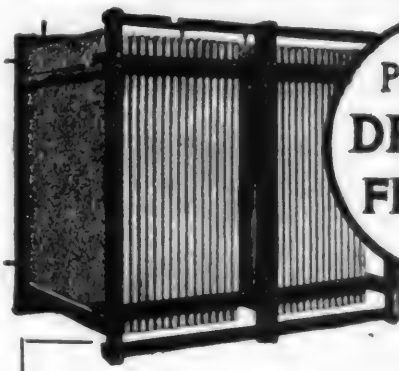

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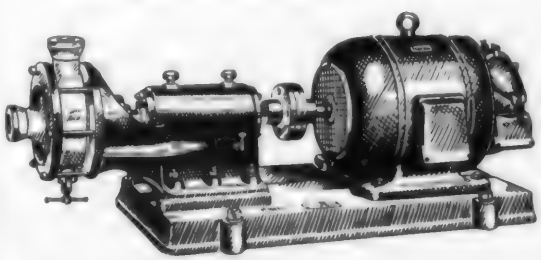

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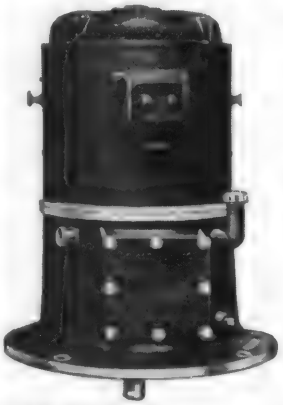

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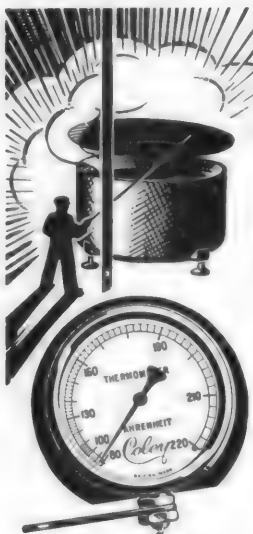

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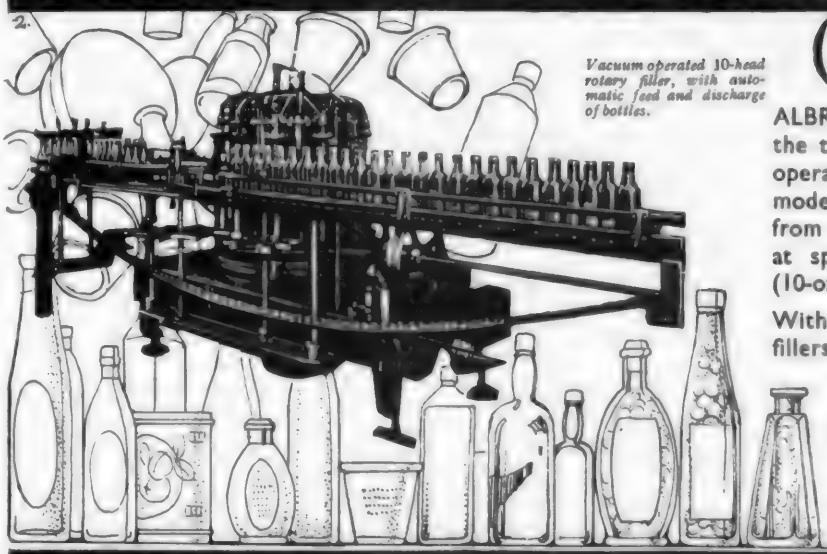

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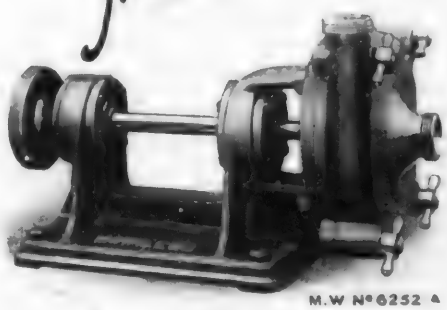

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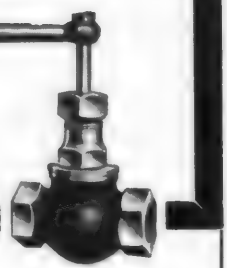

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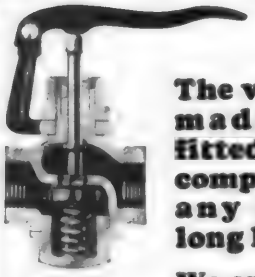

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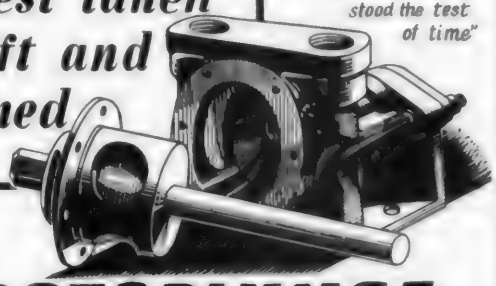

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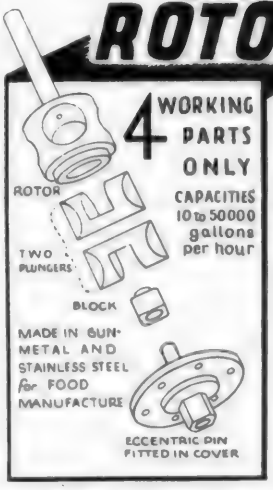
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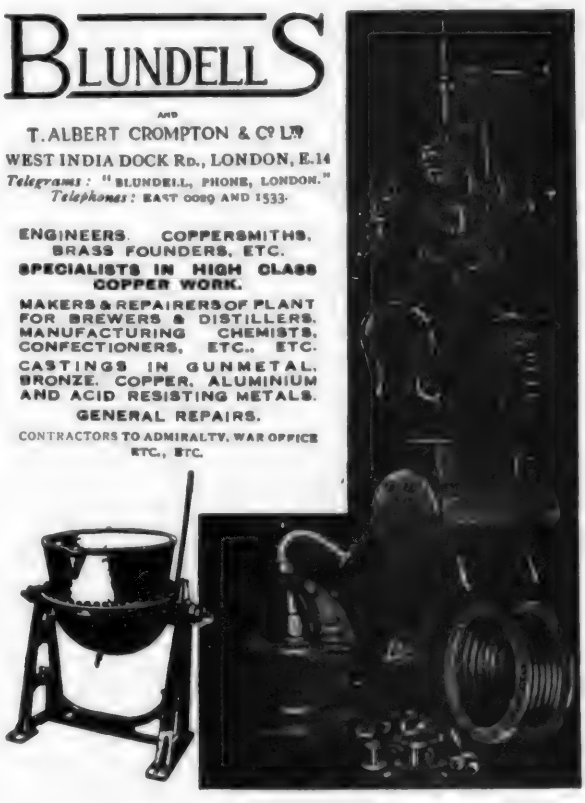

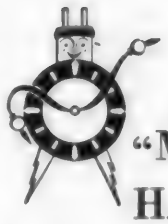

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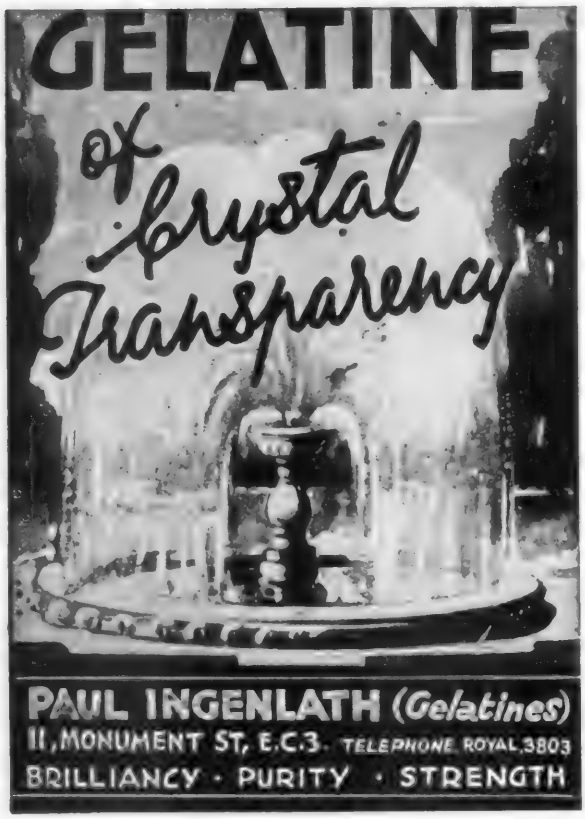

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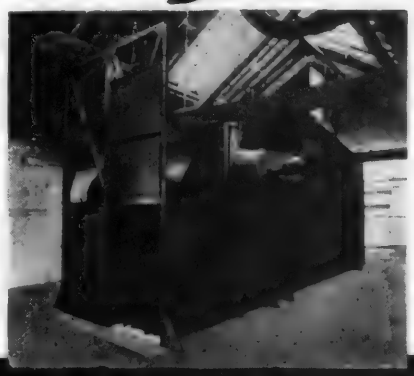

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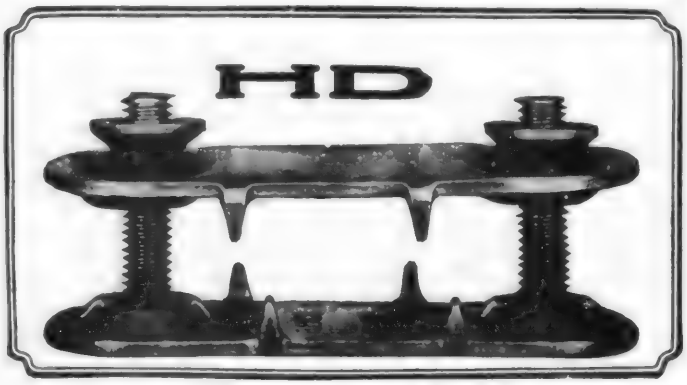
SOYA FOODS, LTD., RICKMANSWORTH

Small Announcements.

Press day, 21st of each month.

Two lines or under, 3s.
Additional lines, 1s.
Prepaid Scale see page lxx.

REPRESENTATIVES whose **EFFICIENCY** can be **INSURED.** 90% make good, many become "stars." Sales Managers wishing to secure first-class salesmen are invited to write for details of unique modern service. Already used by some of Britain's finest firms. No obligation. Write to-day.—The National School of Salesmanship Ltd., Dept. W, Bridgewater House, Manchester, 1.



HD No. 2 Actual Size.

HD BELT FASTENERS

These well-known fasteners stop trouble with elevator and tight butt conveyor joints. They have far more strength than needed and the pull is equalized on both sides of the belt insuring long service. Note recessed plates which embed in and compress the belt instead of pulling against the bolt holes.

Also made in MONEL METAL, which is acid-resisting.

J. B. STONE & Co., Ltd.

135 Finsbury Pavement, London, E.C.2

MISCELLANEOUS SALES

THE WARREN PRODUCE COMPANY, Ightham, Kent, have for immediate disposal the following cans:

Quantity	Capacity	Actual Cost Per Gross
20,800	4½ pts.	40/-
2,570	3 ,,	36/-
4,380	1½ ,,	20/9
6,128	2 ,,	28/-
6,916	1 ,,	20/-

The large sizes are IX plate, lacquered with special lacquer suitable especially for meat, chicken or other high-class canning. For quick disposal low offer will be accepted to clear the lot

TINNING and Re-tinning by our perfected Alloy-Coat Process, Mixing Pans, Boilers, Sieves, Kettles, etc.—Randall's, Green Street Works, Paddington, W.2. Phone: AMBassador 1661.

WEIGHING MACHINES.—All sizes and types in stock, new and second-hand. — Write for particulars: Parsons Scale Works, Bradford.

PUBLICATIONS WANTED

WANTED Urgently, copy of February, 1936, *Food Manufacture.*—Apply W. J. Barton Ltd., Kemp Road, Dagenham, Essex.

PATENTS AND TRADE MARKS

PATENTS AND TRADE MARKS.—Any readers requiring information and advice respecting Patents, Trade Marks, or Designs, should apply to Rayner & Co., Patent Agents, of 5, Chancery Lane, London, who will give free advice to readers mentioning "Food Manufacture."

COATING FOODSTUFFS. The owners of British Patent 293735, for "Protecting Vitamin-Containing Foodstuffs," wish to negotiate with interested parties for the granting of licences on reasonable terms.—Please address communications, Feeny and Feeny, 73A Queen Victoria Street, E.C.4.

KING'S PATENT AGENCY LTD. (B. T. King, Registered Patent Agent), 146a, Queen Victoria Street, London, E.C. 4. Advice, Handbook, and Consultations on Patents and Trade Marks free. 'Phone: City 6161.

REGINALD W. BARKER & CO. (Est. 1886), 56 Ludgate Hill, London, E.C.4. Patent and Trade Mark Booklets sent gratis.

DUROMA ESSENCES

FOR JELLIES, CONFECTIONERY, BAKERY, BISCUITS, ETC.

DUROMA PRODUCTS SALES OFFICE: BREWHOUSE BANK, NORTH SHIELDS
LABORATORIES & WORKS: ELMWOOD ROAD, CROYDON

SECOND-HAND PLANT FOR SALE

HARRISON CARTER, LTD., Dunstable, have two of their own Disintegrators, taken in exchange for new equipment. All completely overhauled and in every respect equal to new. Sizes, B. Mill and 00.

MAIDEN for Machinery.—Save money and send enquiries for all Cooked Meat and Preserving Plant to Wright Street, Southport. Telephone: 2943.

MIRACLE Grinders, Disintegrators, Stone Grinders, Centrifugal Sifters, Reels, Sifters and Mixers, Horizontal and Vertical Mixers, Elevators, Conveyors, Steam Jacketed Worms and Mixers.—F. Stacey & Co. Ltd., Vauxhall Street, Birmingham 4.

PORTABLE Conveyors and Elevators by H. Simon, Manchester. Electrically driven. Little used. 34 in. wide. Low price to clear.—Staple, Boulogne-sur-Mer, France.

SEVERAL Retorts, horizontal and vertical. Complete Sausage Factory Plant, including cutters of all sizes, small and giant mincers. Hydraulic oil-electric and mechanical power Fillers. Quantities of Automatic Refrigerators with chambers. Also complete contents of a large Bakery, including ovens.—Maiden, Wright Street, Southport. Telephone: 2943.

SEVERAL "Rose" Caramel Wrapping Machines, practically new.—Box A819, *Food Manufacture*, 17, Stratford Place, W.1.

'Phone: 98 Staines.

THREE High-Pressure Jacketed Copper Pans, 24 by 18 ins; Baker Perkins Four-Speed 80-qt. Mixer; Werner "Z" Blade Two-Speed Mixer, 20 by 20 by 20 ins.; 5-ft. Granite Melangeur; Stainless Steel-Jacketed Pan, 25 by 23½ ins. deep; Three-Roll Chocolate Refiner; Two Fox's Silent Tapping Tables.—Harry H. Gardam and Co. Ltd., Staines.

TWO 24-in. "Bausman" Chocolate Grinders; six 60-gallon Copper Jacketed Tilting Pans, with Coils; several Disintegrators and Melangeurs; 60, 40, 30, and 10-gallon Werner Blenders. Please write for lists: Winkworth for Machinery, London Road, Staines. Tel.: 1010.

TWO 3-pan Gas Travelling Ovens, manufactured by Baker Perkins, 16 ft. long for 26 by 26 in. pans. Can be adapted for town or producer gas. Obtainable at bargain price.—Apply Biscuits Drapeau, Merxem, Antwerp, Belgium.

WOODBURN No. 1 Size Sugar Disintegrator, also Christy & Norris 1½ Size.—Box A759, *Food Manufacture*, 17 Stratford Place, W.1.

MISCELLANEOUS SALES

FRUIT PULP BROKERS

WARWICK AGENCIES, Specialists in all Food Manufacturers' Raw Materials, Fruit Pulps, Anchovies, Shrimps, Shrimp Extract, Tomato Purées and Pastes, Sulphured Cherries, Skins in Brine, etc., etc., Spot Stocks and for Direct Shipment to any port.—2, Laurence Pountney Hill, Cannon Street, London, E.C.4. 'Phone: Man. House 9676. 'Grams: "Capsicum, London."

DRIED MILK.—Buyers of Full Cream, Half Cream, Separated, Whey Powder, Buttermilk Powder, Spray Process, Separated, soluble in cold water, are invited to apply for samples and quotations, stating probable requirements. — Prideaux's Ltd., Motcombe, Shaftesbury, Dorset.

HARRY TRUSCOTT, 63, Grosvenor Road, Caversham (and at Coupar Angus, Perthshire), for Fruit Pulps. Speciality: Scotch Raspberries, both fresh and preserved.

STAFF Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition.—Write "Betarcol," Box A801, *Food Manufacture*, 17, Stratford Place, W.1.

STERILIZING EQUIPMENT—for utensils. Also Bottle Cleaning and Sterilizing Machinery by "Correct Process." List No. 53 contains over fifty years' practical experience.—Post free on application to the Thomas Hill Engineering Co. (Hull), Ltd., 35 Park Lane, Hull.

TIME RECORDERS AND ELECTRIC CLOCKS.—We have a large selection of new and rebuilt models of all systems in stock, fully guaranteed.—Time Recorder Supply and Maintenance Co., 159, Grange Road, London, S.E.1.

SITUATIONS VACANT

A WELL-KNOWN British Firm requires keen young man for experimental work in connection with the development of new food products. Some knowledge of chemistry desirable.—Apply by letter, stating age, qualification, and salary required, to Box A820, *Food Manufacture*, 17, Stratford Place, W.1.

CAPABLE man or woman, clean worker with thorough practical experience in manufacture of Lemon Curds, Piping Jellies, Filling Creams and Sundries for Bakery Trade, State details of present and past employment.—Box A817, *Food Manufacture*, 17, Stratford Place, W.1.

ESSENCES and Allied Products. Representative required. Must be experienced. Connection desirable, but not essential. —All particulars in strictest confidence to Cumming, Parsons Ltd., Lilley St. Works, Collyhurst, Manchester 9.

MEAT Preserving Factory Manager, capable taking charge factory 200 employees. State in confidence experience, age, salary expected. Exceptional opening for further promotion.—Box A814, *Food Manufacture*, 17, Stratford Place, W.1.

SAUCE and Pickle Manufacturers require Factory Manager.—Write, stating experience, etc., salary required, to Box A821, *Food Manufacture*, 17, Stratford Place, W. 1.

SITUATIONS WANTED

COLOURIST, Chemist, age 24, single, seeks position ; having four years' experience in research, control and operation of decorating fabricated metals and packaging materials. Previously employed in industrial organic chemical engineering. References as to ability, character and academic accomplishments will be furnished.—Box A813, *Food Manufacture*, 17, Stratford Place, W.1.

FACTORY Manager is open for engagement to Food Manufacturing Company. Qualified industrial chemist and cost accountant. Able to install and operate a system of costing to provide monthly factory profit statements and regular reports on efficiency and costs on all processes. Capable of tactfully and efficiently handling labour. Desirous of joining a reputable Company which is considering improving methods of manufacture and increasing profits.—Box A815, *Food Manufacture*, 17, Stratford Place, W.1.

BUSINESS OPPORTUNITIES

FINANCIAL and/or active interest wanted in small Company (England), manufacturing Bakers Confectioners sundries. Guarantee improve existing, and introduce new paying lines.—Box A822, *Food Manufacture*, 17, Stratford Place, W.1.

MANUFACTURERS of Proprietary Food Product are prepared to consider purchase of similar businesses. Established connection with grocery trade preferred, but not essential. —Write in confidence, Box A816, *Food Manufacture*, 17, Stratford Place, W.1.

MANUFACTURERS require recipes for practical Manufacturing in bulk non-perishable new food articles to be marketed at popular prices. Will pay well for satisfactory lines. —Box A811, *Food Manufacture*, 17, Stratford Place, W.1.

BUSINESS OPPORTUNITIES

SMALL COMPANY being formed to manufacture Bakers' Requisites, invite Investment interest.—Box A823, *Food Manufacture*, 17, Stratford Place, W.1.

SECOND-HAND PLANT WANTED

FACTORY which will be built shortly in Palestine demands offers of machines for preserving fruits, jams, marmalades and fruit syrups, and of ready glassware. Please send catalogues with prices c.i.f., Haifa. (The machines must be adjusted for electric power.)—Please write to I. Shpilner, P.O.B. 1701, Tel-Aviv, Palestine.

GARDNER Rapid Sifter and Mixer. Large size preferred.—Box A786, *Food Manufacture*, 17, Stratford Place, W. 1.

LARGE MINCER for Sausage Factory. Full details, capacity, maker, age and where can be seen. Price, C.I.F., Dublin. —P. Kavanagh & Sons, Brabazon Street, Dublin.

"RAPID" Sifter and Mixer, 60-100 lbs. capacity.—Full particulars and lowest price to Box A808, *Food Manufacture*, 17, Stratford Place, W.1.

WANTED, Second-hand Labelling Machine for Canned Goods.—Full particulars to E. H. Steele Ltd., Diamond Buildings, Bolton.

SECOND-HAND PLANT FOR SALE

AIR Compressors, Vacuum Pumps, etc., new and second-hand. —Lacy-Hulbert & Co., Ltd., Pneumatic Engineers, Beddington, Croydon.

AS NEW, Gardner Moisture Adding Plant, also Gardner Sifters and Mixers, Steam Jacketed Mixers, Worm Conveyors, Elevators, Miracle Grinders, Barron Grinders, Disintegrators.—F. Stacey & Co., Vauxhall Street, Birmingham 4.

PREPAID ADVERTISEMENT SCALE

The Scale of Charges for Classified "Smalls" in

FOOD MANUFACTURE

is as follows :

WORDS	ONCE	SIX TIMES
16	3s. 0d.	12s. 0d.
17 to 24	4s. 0d.	16s. 0d.
25 to 32	5s. 0d.	20s. 0d.
33 to 40	6s. 0d.	4 s. 0d.
41 to 48	7s. 0d.	28s. 0d.

And 6d. extra if a Box Number is required.

Jointing a Jacketed Pan

Use "PERMAC," the metal-to-metal jointing material. "PERMAC" joints remain tight until they have to be broken down for annealing. In addition they can be broken down easily without damage to the joint faces. Send for a trial 1-lb. tin—2/6.

"Permac" joints on a Jacketed Pan

Permac
METAL-TO-METAL JOINTING MATERIAL

THOMAS & BISHOP LTD.

37 TABERNACLE STREET, LONDON, E.C.2

Telephone: Clerkenwell 1056 and 0584

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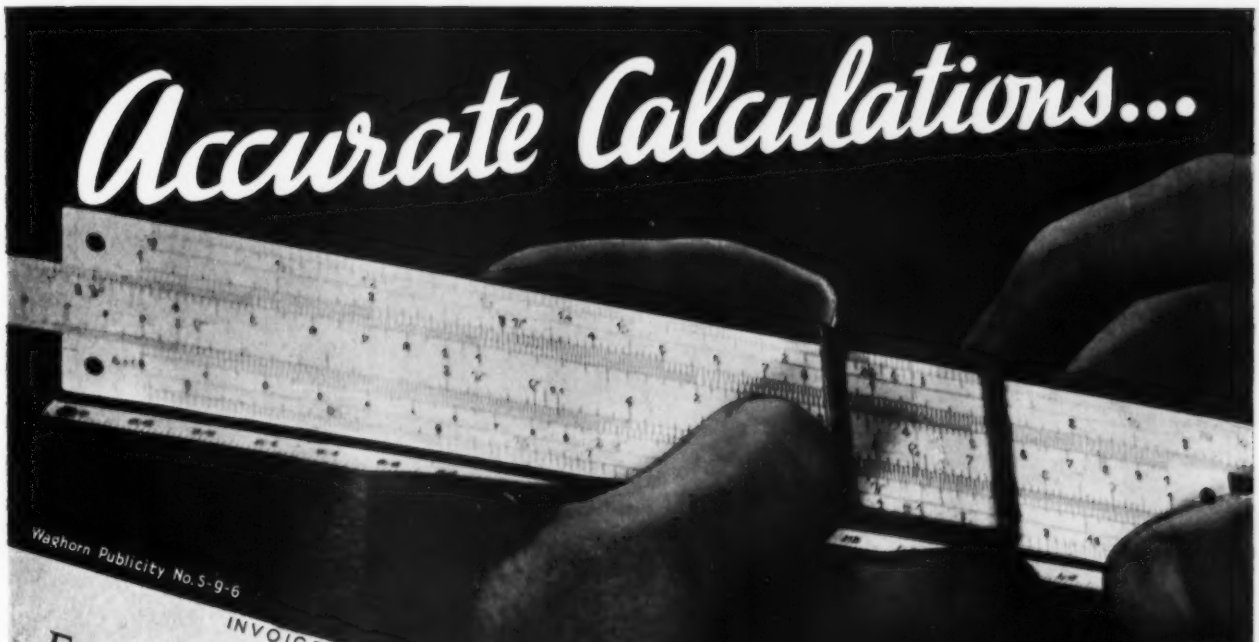

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throughout your works. Examine your Plant Maintenance Accounts for the truth. Friction, wear and stoppages resulting from indifferent lubrication will take the edge off your profits but SILVERTOWN OILS will earn dividends by promoting increased mechanical efficiency. Why not investigate? Ask for Publication No. B.8A.

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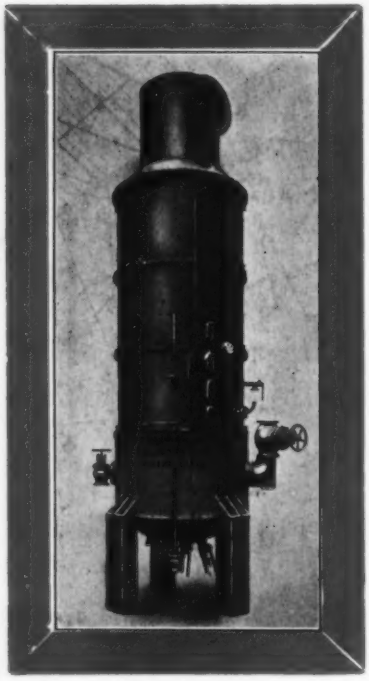

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can only be guaranteed if your products reach the customers in the same condition as they leave your factory. Make absolutely certain that this is the case by sealing your containers with condition-defying rings of the purest quality.

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Guaranteed qualities conforming with Food and Drugs Acts for Phoenix Automatic and Reseal Caps, Sealing Compounds, Rubber Moulds and Fondants.

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